THE ALCYONACEA OF THE SIBOGA EXPEDITION

WITH AN ADDENDUM TO THE GORGONACEA

Siboga-Expeditie
XIIId

THE

ALCYONACEA OF THE SIBOGA EXPEDITION

WITH AN ADDENDUM TO THE GORGONACEA

BY

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[with assistance from Prof. W. R. SHERRIFFS, D.Sc., Southampton, as regards Dendronephthya, from DOROTHY CHALMERS, B.Sc., Aberdeen, as regards Siphonogorgia, and from Dr. J. J. SIMPSON, Aberdeen, as regards Stereonephthya and some related genera.]

With 28 plates and 1 textfigure

LATE E. J. BRILL LTD
PUBLISHERS AND PRINTERS
LEIDEN — 1931

INTRODUCTION.

This Report contains a description of a rich collection of Alcyonacea made in the Far East by the Siboga Expedition, and entrusted to us by Professor MAX WEBER. It includes besides Alcyonacea a few representatives of the orders Stolonifera and Telestacea, and incidentally, a few representatives of the Gorgonacea — an order which had been previously dealt with by Professor NUTTING.

The numerical proportions of the forms dealt with will be seen from the following table. Under the heading New Species are included those new species of the Siboga Expedition which have been given a preliminary description by SHERRIFFS, CHALMERS and DEAN [1]).

ORDER	GENERA	NEW GENERA	SPECIES	NEW SPECIES
Order I. Stolonifera:	Genera 6	New Genera 0	Species 14	New Species 5
Order II. Alcyonacea:	Genera 26	New Genera 2	Species 169	New Species 50
Order III. Gorgonacea: (incidental)	Genera 30	New Genera 0	Species 49	New Species 3
Order IV. Telestacea:	Genera 3	New Genera 0	Species 8	New Species 2

(The order Pennatulacea was dealt with by HICKSON in magistral fashion.)

SOME OUTSTANDING FEATURES OF THE COLLECTION.

Attention may be called to some outstanding features.

(1) Of interest in its primitiveness is *Anthelia simplex* n. sp.

(2) While the authority of HICKSON himself is rather against our verdict, we adhere to the view that Hicksonia should be kept separate from Clavularia. It is remarkable in its cross bridges between adjacent polyps. The genus is represented in the collection by *Hicksonia viridis* (Quoy et Gaimard) and *H. köllikeri* Dean.

1) We have been indebted to Professor W. RAE SHERRIFFS, D.Sc., for a first survey of the genus Dendronephthya (and a number of new species must bear his name), to Miss DOROTHY CHALMERS, B.Sc., for dealing similarly with Siphonogorgia (and a number of new species are hers), to Dr. J. J. SIMPSON for invaluable help at difficult corners and for revising a large part of the manuscript and editing the plates; and to Miss ALICE M. DAVIDSON for her admirable draughtsmanship and for her unfailing patience.

(3) It was interesting to find a recurrence of the remarkable *Pachyclavularia erecta* which ROULE described many years ago from Amboina. We were able to compare the Siboga specimens with his, through the kindness of Professor REVILLIOD, Director of the Natural History Museum in Geneva.

(4) It has seemed justifiable to establish a new genus Protodendron for a very interesting primitive form, previously described as *Coelogorgia repens* by THOMSON and HENDERSON.

(5) The multitudinous monotony of the genus Xenia was somewhat relieved by re-finding the dimorphic *Xenia ashworthi*, and embedded in it a parasitic Copepod, — probably a unique record.

(6) Worthy of special mention on account of its striking beauty — primus inter pares — is *Nidalia splendens* n. sp.

(7) Very puzzling geographically, and in small tubes without labels, are two fragmentary specimens which we cannot but refer to the species described by KOCH as *Daniela koreni* and *Cereopsis studeri*.

(8) As an instance of a species definitely marked by a triviality, we may call attention to *Lemnalia squamifera* which shows an interesting developmental series of minute sculptured scales, and has them not only as usual on the tentacles, but dusted over the body in a remarkable way.

(9) After much consideration we have established an annectent genus Umbellulifera for a form, *Paraspongodes striata* Thomson and Henderson, which has been much bandied about. Along with two others species (one new) this type appears to us to be of generic standing and a connecting link between Dendronephthya and Eunephthya.

(10) Of interest is the large representation of the genus Stereonephthya, with no fewer than eight new species out of a total of nine.

(11) The species of Dendronephthya — probably in a mutating phase — remain very difficult to deal with, but we have verified and extended SHERRIFFS' useful idea of laying the main emphasis on the architecture of the 'points' of the anthocodiae. No fewer than 32 species have had to be dealt with, of which 6 are new.

(12) Miss CHALMERS has made a careful revision of the genus Siphonogorgia including a critical consideration of the specific characters. Out of 23 species dealt with it has been necessary to regard 8 as new.

(13) We have been able to revise and confirm the interesting and sharply defined genus Cactogorgia established by SIMPSON. A clear-cut new species is added.

(14) The remarkable family of Fasciculariidae, with the polyparium retractile into an involucre, is represented by *Paralcyonium elegans* and by four species (two of which are new) of Studeriotes Thomson, one of the most remarkable of all Alcyonarians.

(15) While it was not part of our task to deal with Gorgonacea, so well dealt with by NUTTING, we have named or made notes on the casual specimens included along with the Alcyonacea; and it is a pleasure to notice that our identifications have been on the whole confirmatory.

(16) Worthy of special mention is a new species of KÜKENTHAL's little known genus, Muricellisis.

(17) Even more remarkable are two new species of VERSLUYS' unique genus Pseudocladochonus which we are inclined to leave in the vicinity of Telesto, in the order Telestacea.

Some fragments which could not be identified satisfactorily are nevertheless of interest, e. g. one with resemblances to Pseudocladochonus, another like an Anthothela, and a Sarcodictyon-like colony which may be a young stage of a Sympodium.

COMPLETE LIST OF SPECIES.

Order STOLONIFERA.

Family CLAVULARIIDAE.

1. *Anthelia garciæ* (Hickson).
2. „ *glauca* (Ehrenberg).
3. „ *ternatana* (Schenk).
4. „ *simplex* n. sp.

1. *Clavularia margaritiferae* Thomson and Henderson.
2. „ *delicatula* n. sp.
3. „ *expansa* n. sp.
4. „ *ornata* n. sp.

1. *Hicksonia viridis* (Quoy et Gaimard).
2. „ *köllikeri* Dean.

1. *Pachyclavularia erecta* Roule.

1. *Sympodium coeruleum* Ehrenberg.
2. „ *fulvum* (Forsk.).

Family TUBIPORIDAE.

1. *Tubipora musica* L.

Order ALCYONACEA.

Family ARCHICAULIDAE n. f.

Genus **Protodendron** n. g.

1. *Protodendron repens* (Thomson and Henderson).

Family XENIIDAE.

1. *Xenia capensis* (Hickson).
2. „ *florida* (Lesson).
3. „ *ternatana* Schenk.
4. „ *viridis* Schenk.
5. „ *umbellata* Savigny.
6. „ *novae-britanniae* Ashworth.
7. „ *crassa* Schenk.
8. „ *garciae* Bourne.
9. „ *ashworthi* Kükenthal.
10. „ *membranacea* Schenk.
11. „ *fusca* Schenk.

1. *Cespitularia coerulea* May.
2. „ *taeniata* May.
3. „ *simplex* n. sp.

Family ALCYONIIDAE.

1. *Nidalia dofleini* Kükenthal.
2. „ *granulata* (Gray).
3. „ *macrospina* Kükenthal.
4. „ *rubra* (Brundin).
5. „ *duriuscula* n. sp.
6. „ *grayi* n. sp.
7. „ *splendens* n. sp.

1. *Metalcyonium capitatum* Pfeffer.

1. *Lobularia ceylonicum* (Pratt).
2. „ *digitulatum* Klunzinger.
3. „ *globuliferum* Klunzinger.
4. „ *pachyclados* Klunzinger.
5. „ *sphaerophorum* Klunzinger.
6. „ *globuliferoides* n. sp.

1. *Alcyonium dendroides* n. sp.
2. „ *molle* n. sp.
3. „ *rotundum* n. sp.
4. „ *simplex* n. sp.

1. *Daniela koreni* Koch.

1. *Cereopsis studeri* Koch.

1. *Sinularia leptoclados* (Ehrenberg).
2. „ *polydactyla* (Ehrenberg).
3. „ *herdmani* (Pratt).
4. „ *quercıformis* (Pratt).
5. „ *aura* (Pratt).
6. „ *rigida* (Dana) var. *amboinensis* (Burchardt).
7. „ *whiteleggei* Lüttschwager.
8. „ *gardineri* (Pratt).
9. „ *tentaculata* n. sp.

1. *Sarcophytum acutangulum* (Marenzeller).
2. „ *ehrenbergi* Marenzeller.

3. *Sarcophytum glaucum* (Quoy et Gaimard).
4. „ *gracile* Burchardt.
5. „ *trocheliophorum* Marenzeller.
   trocheliophorum Marenzeller *minus* n. var.
6. „ *convolutum* n. sp.
7. „ *spongiosum* n. sp.
8. „ *tenuispiculatum* n. sp.

1. *Lobophytum candelabrum* Roule.
2. „ *crassum* Marenzeller.
3. „ *hedleyi* Whitelegge.
4. „ *pauciflorum* Ehrenberg.

1. *Anthomastus agaricus* Studer.

Family NEPHTHYIDAE.

1. *Lithophytum stuhlmanni* (May).
2. „ *viridis* (May).

1. *Capnella fungiformis* Kükenthal.
2. „ *imbricata* (Quoy et Gaimard).
3. „ *morula* Thomson and MacKinnon.

1. *Lemnalia rhabdota* Bourne.
2. „ *peristyla* Bourne.
3. „ *nitida* (Verrill).
4. „ *cervicornis* (May).
5. „ *terminalis* (Quoy et Gaimard).
6. „ *brassica* (May).
7. „ *thyrsoides* (Ehrenberg).
8. „ *laevis* n. sp.
9. „ *squamifera* n. sp.

Genus **Umbellulifera** n. g.

1. *Umbellulifera striata* (Thomson and Henderson).
2. „ *graeffei* (Kükenthal).
3. „ *petasites* n. sp.

1. *Nephthya albida* (Holm).
2. „ *amentacea* Studer.
3. „ *columnaris* Studer.
4. „ *chabrolii* Audouin.
5. „ *cupressiformis* Kükenthal.
6. „ *erecta* Kükenthal.
7. „ *grisea* Kükenthal.
8. „ *inermis* (Holm).
9. „ *pacifica* Kükenthal.
10. „ *sphaerophora* Kükenthal.
11. „ *striata* Kükenthal.
12. „ *tenuis* (Kükenthal).
13. „ *thujaria* Kükenthal.
14. „ *tongaensis* Kükenthal.
15. „ *capnelliformis* n. sp.
16. „ *cervispiculosa* n. sp.
17. „ *gracillima* n. sp.
    „ *gracillima* n. sp. var *minor*.
18. *Nephthya junipera* n. sp.
19. „ *sibogae* n. sp.

1. *Dendronephthya gigantea* (Verrill).
2. „ *intermedia* n. sp.
3. „ *punicea* (Studer).
4. „ *klunzingeri* (Studer).
5. „ *japonica* Kükenthal.
6. „ *ehrenbergi* Kükenthal.
7. „ *microspiculata* (Pütter).
8. „ *mirabilis* Henderson.
9. „ *mollis* (Holm).
10. „ *suensoni* (Holm).
11. „ *orientalis* Henderson.
12. „ *cervicornis* (Wright and Studer).
13. „ *halterosclera* n. sp.
14. „ *flammea* Sherriffs.
15. „ *habereri* Kükenthal.
16. „ *annectens* Sherriffs.
17. „ *brevirama* (Burchardt).
18. „ *amoebisclera* n. sp.
19. „ *florida* (Esper).
20. „ *stolonifera* (May).
21. „ *dofleini* Kükenthal.
22. „ *armifer* n. sp.
23. „ *hyalina* Kükenthal.
24. „ *collaris* (Wright and Studer).
25. „ *reticulata* n. sp.
26. „ *lutea* Kükenthal.
27. „ *disciformis* Kükenthal.
28. „ *pumilio* (Studer).
29. „ *rubescens* n. sp.
30. „ *coronata* (Wright and Studer).
31. „ *longicaulis* Kükenthal.
32. „ *simplex* Sherriffs.

1. *Stereonephthya bellissima* n. sp.
2. „ *divergens* n. sp.
3. „ *ilex* n. sp.
4. „ *imbricans* n. sp.
5. „ *macrospiculata* Thomson and MacKinnon.
6. „ *pedunculata* n. sp.
7. „ *sierra* n. sp.
8. „ *spicata* n. sp.
9. „ *ulicoides* n. sp.

Family SIPHONOGORGIIDAE.

1. *Siphonogorgia annectens* Thomson and Simpson.
2. „ *asperula* Thomson and Simpson.
3. „ *cylindrata* Kükenthal.
4. „ *densa* Chalmers.
5. „ *eminens* Chalmers.
6. „ *godeffroyi* Kölliker.

7. *Siphonogorgia gracilis* (Harrison).
8. „ *grandior* Chalmers.
9. „ *hicksoni* (Harrison).
10. „ *indica* Thomson.
11. „ *köllikeri* Wright and Studer.
12. „ *macrospina* Whitelegge.
13. „ *miniacea* Kükenthal.
14. „ *mirabilis* Klunzinger.
15. „ *obspiculata* Chalmers.
16. „ *obtusa* Chalmers.
17. „ *palmata* Thomson and Simpson.
18. „ *pauciflora* Chalmers.
19. „ *ramosa* Chalmers.
20. „ *rugosa* Chalmers.
21. „ *simplex* Chalmers.
22. „ *splendens* Kükenthal.
23. „ *variabilis* (Hickson).

1. *Scleronephthya crassa* (Kükenthal).
2. „ *flexilis* Thomson and Simpson.
   compacta n. var.
3. „ *pustulosa* Wright and Studer.

1. *Stereacanthia indica* Thomson and Henderson.
2. „ *spiculosa* (Kükenthal).

1. *Cactogorgia lampas* Thomson and MacKinnon.
2. „ *simpsoni* n. sp.

Family FASCICULARIIDAE.

1. *Paralcyonium elegans* Milne-Edwards.

1. *Studeriotes crassa* Kükenthal.
2. „ *longiramosa* Kükenthal.
3. „ *debilis* n. sp.
4. „ *spinosa* n. sp.

Order GORGONACEA.

Sub-Order SCLERAXONIA.

Family BRIAREIDAE.

1. *Iciligorgia orientalis* Ridley.

1. *Semperina brunnea* Nutting.
2. „ *köllikeri* (Studer).
3. „ *macrocalyx* (Nutting).

1. *Solenocaulon tortuosum* Gray.

1. *Spongioderma chuni* Kükenthal.

Family SUBEROGORGIIDAE.

1. *Suberogorgia köllikeri* Wright and Studer.
2. „ *pulchra* Nutting.
3. „ *verriculata* (Esper).
4. „ *ornata* Thomson and Simpson.

1. *Keroeides koreni* Wright and Studer.

Family MELITODIDAE.

1. *Melitodes esperi* Wright and Studer.
2. „ *ochracea* (L.).
3. „ *variabilis* Hickson.

1. *Mopsella spinosa* Kükenthal.

1. *Wrightella coccinea* (Ellis and Solander).
2. „ *superba* Kükenthal.

1. *Acabaria formosa* Nutting.
2. „ *ramulosa* Kükenthal.

Sub-Order HOLAXONIA.

Family PLEXAURIDAE.

1. *Euplexaura robusta* Kükenthal.

1. *Paraplexaura verrucosa* (Brundin).

Family MURICEIDAE.

1. *Menacella reticularis* Gray.

1. *Elasmogorgia filiformis* Wright and Studer.
2. „ *filigella* n. sp.

1. *Thesea placoderma* Nutting.
2. „ *sanguinea* Nutting.

1. *Acis squamata* Nutting.

1. *Muricella argentea* (Nutting).
2. „ *ceylonensis* Thomson and Henderson.

1. *Anthogorgia annectens* n. sp.

1. *Acamptogorgia rubra* Thomson.

1. *Echinogorgia aurantiaca* (Val.).
2. „ *complexa* Nutting.
3. „ *pseudosassapo* Kölliker.

1. *Bebryce indica* Thomson.
2. „ *hicksoni* Thomson and Henderson.
3. „ *thomsoni* Nutting.

1. *Discogorgia bebrycoides* (Nutting).

1. *Heterogorgia muricelloides* Nutting.

Family ACANTHOGORGIIDAE.

1. *Acanthogorgia angustiflora* Kükenthal and Gorzawsky.
2. „ *muricata* Verrill.
3. „ *striata* Nutting.

Family PRIMNOIDAE.

1. *Thouarella moseleyi* Wright and Studer.

Family GORGONIIDAE.

1. *Pseudopterogorgia pinnata* (Nutting).

Family GORGONELLIDAE.

1. *Junceella racemosa* (Wright and Studer).

1. *Nicella carinata* Nutting.
2. „ *dichotoma* Gray.

Family ISIDAE.

Sub-family ISIDINAE.

1. *Isis hippuris* L.

Sub-family MURICELLISIDINAE.

1. *Muricellisis cervicornis* n. sp.

Order TELESTACEA.

1. *Telesto arborea* Wright and Studer.
2. „ *multiflora* Laackmann.
3. „ *prolifera* (W. Koch.).
4. „ *rubra* Hickson.
5. „ *rupicola* (F. Müller.)

1. *Coelogorgia palmosa* (Val.).

1. *Pseudocladochonus mosaica* n. sp.
2. „ *versluysi* n. sp.

Some very interesting fragments which we deliberately leave unnamed, e.g. one like a Pseudocladochonus, another like an Anthothela.

Order STOLONIFERA.

Family CLAVULARIIDAE.

Genus **Anthelia.**

1. *Anthelia garciæ* (Hickson).

For description see: HICKSON, Revision of Stolonifera. Trans. Zool. Soc. XIII, 1894, p. 341, 1 fig.

Stat. 33. Bay of Pidjot, Lombok. 22 M. and less. Mud, coral and coral sand. 1 Ex.
Stat. 37. Sailus Ketjil, Paternoster Islands. 27 M. and less. Coral and coral sand. 1 Ex.
Stat. 81. Sebangkatan. 34 M. Coral bottom and Lithothamnion. 5 Ex.
Stat. 144. Damar. 25 fathoms. 1 Ex.
Stat. 248. Tiur. 1 Ex.

Several colonies of a whitish colour, with polyps slightly greenish, agree with what HICKSON described as *Clavularia garciæ* better than with any other form. From a basal membrane the polyps arise somewhat crowdedly to a height of 1 cm., excluding the tentacles. These may reach 7 mm. and bear long pinnules, often up to 1.8 mm. in length.

We refer these specimens to *Anthelia garciæ* (Hickson) for the following reasons:

(*a*) the abundance of minute rodlets, about 0.5 mm. in length, with rounded corners, and minute asperities;
(*b*) the numerous long pinnules which give the tentacles a fluffy appearance;
(*c*) the thin-walled flabby nature of the polyps and tentacles;
(*d*) the mouth is very small and situated on a papilla.

We suggest that HICKSON's diagnosis should be enlarged to include forms where the pinnules may be about sixty on each side, tending to an arrangement in three rows and almost hiding the adoral median line, while the aboral median line is a long bare tongue. It should be noted that a younger polyp may have only twenty pinnules on each side (HICKSON counted thirty). In some other specimens both polyps and tentacles are densely dusted with rodlets, almost touching one another.

Two small specimens from Station 177 are referred to *Anthelia garciæ* (Hickson) mainly on the ground that the abundant spicules are rodlets with rounded ends, showing under high power numerous minute asperities. The tentacles show on each side two rows of somewhat over a dozen pinnules. From examination we are convinced that the appearance of two rows on one specimen may be replaced by one row with double the number on another. The spicules are not sparse as in the specimens from Station 64, but dust the surface. Their maximum length, 0.05 mm., agrees with HICKSON's measurement.

A colony of creamy grey polyps from Station 33, up to 1 cm. long, arising from a membranous base which encrusts a solitary Madrepore, has tentacles with long pinnules, about 24 on each side.

Another fine cream-coloured colony from Station 37, with a membranous base encrusting a piece of Madrepore coral.

A rather withered colony from Station 248, Tiur, seems referable to this species. The polyps, up to 1 cm. long, arise in a crowded mass from the basal membrane. The pinnules are rather long and narrow and give a somewhat fluffy appearance to the tentacles even in their shrivelled condition. The spicules attain a length of 0.05 mm.

Previously, if our identification is correct, from Diego Garcia, Chergoo Archipelago.

2. *Anthelia glauca* (Ehrb.).

For revised description see: KÜKENTHAL, Über einige Korallentiere des Roten Meeres; Jenaische Denkschriften, XI, 1904, p. 43, 2 figs.

Stat. 60. Haingsisi. 23 M. Lithothamnion. 2 Ex.
Stat. 81. Sebangkatan. 34 M. Coral bottom and Lithothamnion. 2 Ex.
Stat. 89. Kaniungan Ketjil. Reef. Numerous Ex. some fragmentary.
Stat. 152. Wunoh-bay. 32 M. Lithothamnion-bottom. 1 Ex.
Stat. 252. Taam. 27 M. 1 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 1 Ex.

A colony of a creamy colour, from Station 81, with a membranous basis spreading over a coral, with crowded polyps, the surface glistening with spicules, sometimes with faint longitudinal ribs, rising to an average height of 8 mm., the tentacles being about half as much more.

The characteristics of this species, as revised by KÜKENTHAL, who includes with it *A. strumosa* (Ehrb.), *Sympodium fuliginosum* (Ehrb.) and *S. purpurascens* (Ehrb.), are chiefly the following: — Stolons usually broadened into a membrane; polyps 1—2 cm. in length; two rows of about 12 pinnules on each side of the tentacles; numerous calcareous granular rodlets; colour very variable, light yellow, light grey, blue-green, reddish.

Several pinkish colonies from Kaniungan Ketjil show some less contracted polyps with distinctly longer and narrower pinnules, which may be fifteen on each row; but even this is included within the limits of KÜKENTHAL's diagnosis. From the examination of numerous specimens we conclude that very little importance can be attached to minor variations in the number and disposition of the pinnules. The rodlets of the pinkish forms are slightly longer, 0.06 mm. instead of 0.05 mm.; but the limits KÜKENTHAL records are 0,05—0.09 mm.

In a few specimens from Taam, 27 M. there is this difference, which cannot be regarded as more than individual, that along with the rodlet spicules there are many definitely narrower (0.1 × 0.006 mm.), approximating to the blunt needle type. Moreover, the rodlets have more numerous minute asperities.

A small colony from Station 60, Haingsisi, consists of stout cream-coloured polyps, about 1 cm. long, with tentacles bearing 16—17 pinnules on each side, mainly arranged in a double row. Numerous granular rodlets are present.

A small pinkish colony from Station 315 shows tentacles with on each side two rows of 12 pinnules in each row.

A withered colony from Station 152, shows shrivelled polyps, up to 1 cm. long, with tentacles bearing on each side two rows of pinnules, about 12 in each row.

Previously recorded from the Red Sea.

3. *Anthelia ternatana* (Schenk). (Plate XIV, fig. 2).
= *Clavularia ternatana* Schenk.

For description see: SCHENK, Clavulariiden etc. von Ternate, Abhandl. Senckenberg. Nat. Ges. XXIII, 1896, p. 45, 1 fig.

Stat. 64. Djampeah. 32 M. Coral, coral sand. Various Ex. broken up.
Stat. 81. Sebangkatan. Reef. Coral bottom and Lithothamnion. 1 Ex. broken up.
Stat. 93. Sanguisiapo. Reef. Sand and coral. 1 Ex.
Stat. 104. Sulu. 14 M. Sand. 2 Ex.

A badly preserved but interesting yellowish-grey specimen from Station 104, Sulu, agrees with *Anthelia ternatana* (Schenk) in the following respects:

(*a*) From a membranous basis there spring very long polyps, up to 41 mm. in length, without including the tentacles.
(*b*) the tentacles are narrow and very long (up to 22 mm.).
(*c*) the surface of the polyp is densely covered with minute rodlets, lying in various directions.
(*d*) the spicules are uniform, minute rodlets (0.06 × 0.01 mm.), somewhat like finger-biscuits, with ends rounded or blunt, the surface covered with minute roughnesses.

Several groups from Station 64, Djampea seem to us referable to this species, but the pinnules are not more than 30 on each side, and sometimes only half that number. We are convinced that the number of pinnules within certain limits is mainly an age or growth character.

The polyps in the specimens from Station 64 arise from a membranous expansion to a height of 15—30 mm.; the tentacles are usually 5—8 mm. in length; the walls of the polyps are rather thin; there is very little contraction in any of the specimens; the colour is very light brown. We should compare the spicules to superficially roughened finger biscuits, and they are very like those figured by SCHENK for *Cl. ternatana*. Average dimensions are 0.04 × 0.01 mm.

A whitish grey colony, from Station 81, with crowded substantial polyps, often inflated, in many cases 10—15 mm. in height, rising from an encrusting membrane. One of the distinctive features is the dusting of the surface with very numerous rodlet spicules, about 0.06 × 0.15 mm., with a surface bearing minute asperities. The uncontracted polyps bear long tentacles with 3—4 rows of long slender pinnules, about a score in a row. The appearance of polyps and tentacles varies greatly, of course, according to the state of contraction.

Another cluster from Station 64 shows the same rodlet, slightly roughened spicules, thickly dusted over the surface, and the characteristic lank tentacles with numerous long pinnules, but they number only 24 on each side, which shows, we think, that the number of pinnules is relatively unimportant.

In some fine colonies growing on a mass of sponge from Station 93, Sanguisiapo Reef, the long flaccid polyps up to 41 mm. in length arise from the encrusting basal membrane.

The tentacles attain a length of 10 mm. and show approximately 45 slender pinnules, in a single row on each side of a fully expanded tentacle.

The characteristic features of *A. ternatana* are the following:

(*a*) the notable length of the polyps and tentacles;
(*b*) the abundance of superficially roughened rodlets;
(*c*) the shallow longitudinal grooves of the polyp-body, which is more delicate and flaccid than in most species.

Perhaps *A. garciæ* and *A. glauca* are the most nearly related species, and it must be emphasised that the specific characters in this genus are very variable.

Previously recorded from Ternate.

4. *Anthelia simplex* n. sp. (Plate XIV, Fig. 4).

Stat. 240. Banda. 9—45 M. Black sand. Coral. Lithothamnion-bank in 18—36 M. 1 Ex.

This interesting form is represented by a single polyp rising from a thick membranous base to a height of 2.6 cm. not including the tentacles, the longest of which are 8 mm. in length.

It is a clear Anthelia without any calyx.

Its distinctive features are the following:

(*a*) the pinnules are very simple and short, like those described by Hickson for *Stereosoma celebense*;
(*b*) they occur in a single row, in four tentacles six in a row, while in the other four larger ones there are twelve;
(*c*) the tentacles with twelve pairs of pinnules are fully twice as long as the short ones;
(*d*) the long ones are adjacent to one another, and so with the short ones;
(*e*) the body of the polyp shows vague longitudinal lines; the mouth appears as a longitudinal slit on the top of a short hypostome;
(*f*) the whole surface of tentacles, body, and base is studded with minute blunt-ended rodlets, among which there are many sandy particles; under high magnification the rodlets appear slightly granular;
(*g*) the dimensions of the rodlets are about 0.06 mm. in length by 0.015 mm. in breadth.

In many respects the specimen is very like *Stereosoma celebense*, which was however without spicules.

Genus **Clavularia**.

1. *Clavularia margaritiferæ* Thomson & Henderson.

For description see:

Thomson and Henderson, Report Ceylon Pearl Fisheries, 1905, p. 273, 1 fig.
—— Alcyonaria of Zanzibar, Proc. Zool. Soc., 1906, p. 404.

Stat. 123. Biaru Island. 36—27. M. Stone and Lithothamnion-bottom. 1 Ex.
Stat. 213. Saleyer, Zuid Island. Coral reef. 1 Ex.

Delicate white stolons, about 0.5 mm. across, bear at distant intervals polyps which rise

to a height of 3 mm., and show a distinct division into a calycine and a retractile portion. The species thus belongs to Clavularia in the strict sense, not to Anthelia as KÜKENTHAL suggested.

The interlocked spicules of the calyx are characteristic capstans with a zone of prominent knobs near each end, and some of these forms approach double wheels. In the upper retractile region of the polyp there are delicate rodlets or spindles longitudinally disposed.

Previously recorded from Ceylon and Zanzibar.

2. *Clavularia delicatula* n. sp. (Plate VII, Fig. 10; Plate XXIII, Fig. 4).

Stat. 12. 7° 15′ S., 115° 15′.6 E. 289 M. Mud and broken shells. 1 Ex.

This delicate white specimen from Station 12 cannot be referred to any of the described species of Clavularia. It forms a delicate investment of the tubes of a Tubularia hydroid, but there are also free pieces of stolon like very narrow ribbons. It is a true Clavularia with a calycine portion about 1—2 mm. in height into which a polyp region can be retracted.

The features of the new species are the following:

(1) the polyps are markedly distant from one another, a common interval being 7 mm;
(2) the whole colony is covered with white spicules, mostly spindles;
(3) the spindles lie longitudinally on the stolon, in eight narrow triangles on the retractile part of the polyp, and somewhat irregularly on the calyx; the maximum length is 0.4 mm. and breadth 0.1 mm., but common dimensions are 0.2 by 0.05 mm.;
(4) the most abundant type of spicule is a very warty spindle, often with a tendency to zoning; but besides these there are some pseudo-clubs derived from spindles and some small rather jagged bodies.

The described species to which this form is nearest seem to us to be *Cl dispersa* Kükenthal and *Cl. tubaria* Wright and Studer.

3. *Clavularia expansa* n. sp. (Plate XI, Figs. 1 and 3; Plate XXIV, Fig. 10).

Stat. 221. 6° 24′ S., 124° 39′ E. 2798 M. Solid bluish grey mud with Foraminifera, covered by a 5 cm. thick layer of brown mud, uppermost layer of Foraminifera. 1 Ex.

Growing on a siliceous sponge spicule there is a Clavularian colony whose membranous expansion is spread over a continuous length of 6.3 cm. There is besides a separate patch. Most of the polyps have fallen off, but the height of the longest calyx is 8 mm., with a diameter of about 1.3 mm. The calyx rises at right angles, but is slightly twisted. It is rigid, with 8 prominent longitudinal ridges and deep grooves between. It is long in proportion to the retractile portion.

The specimen is not far from *Cl. peterseni* Kükenthal, but the spiculation is different and shows some approximation to some of the types in *Cl. eburnea*.

The following spicules may be distinguished:

(*a*) stout spindles, with ends often obtuse, covered densely with low but strong tuberosities, frequently compound; 0.4 × 0.07 mm.;
(*b*) some flattened almost scale-like forms, derivable from (*a*), with toothed margins, and relatively smooth surface; 0.37 × 0.12 mm.;

(*c*) slender spindles, with pointed ends, and less crowded tuberosities; 0.18 × 0.02 mm.;
(*d*) rather remarkable pseudo-clubs, derived from type (*a*), but distinctly broadened out at one end;
(*e*) more irregular spindles and flat rodlets with long prominences projecting irregularly;
(*f*) small irregular bodies occasionally approaching stars, and including a few crosses.

4. *Clavularia ornata* n. sp. (Plate XIV, Figs. 1 and 5; Plate XXI, Fig. 2).

Stat. 45. 7° 24′ S., 118° 15′.2 E. 794 M. Fine grey mud, with some Radiolaria and diatoms. 1 Ex.
Stat. 122. 1° 58′.5 N., 125° 0′.5 E. 1264—1165 M. Stone. 1 Ex.

Three specimens of a beautiful form which consist of a thin membrane spreading over a flexible tube and covering it almost entirely. The calyces are very prominent and rigid, and tend to occur in little groups. The whole appearance is somewhat silvery owing to the large superficial spindles.

The length of the longest tube is 13.5 cm., with a diameter of about 1.5 mm. With the membrane included, the diameter of the specimen is 2 mm. The stiff cylindrical calyces, very slightly narrowing upwards, rise to a maximum height of 5 mm., and beyond this the retractile portion protrudes for about 3 mm. The wall of the calyx consists of spindles longitudinally disposed, with a tendency to show 8 double rows slightly chevroned. The anthocodial armature is characteristic, consisting of a strong collar with about 7—9 horizontal rows of spindles, and above that eight triangular points formed from 3—4 pairs of chevroned spindles, marking the bases of the tentacles. On the dorsal surface of the infolded tentacles there is a dense covering of small spicules longitudinally arranged.

The spicules include the following forms:

(*a*) slightly twisted spindles, with minute rounded knobs, tending to occur in rows, giving a suggestion of longitudinal ridges, 0.15 × 0.02 mm. to 1.2 × 0.09 mm.;
(*b*) much less numerous similar spindles with prominent warts, simply rounded, not compound: — up to 0.65 mm. in length and 0.1 mm. in breadth;
(*c*) minute spindles from the tentacles: — 0.06 mm. in average length;
(*d*) a few small crosses: — average distance between adjacent tips 0.1 mm.

A small specimen from Station 122 has more spindles of the *b*-type and fewer of the *a*-type.

This new species seems to be nearest *Cl. armata* Thomson (Resultats Campagnes Scientifiques Monaco, 1927, p. 8, 5 figs.), but differs in the following points:

(1) the collar, though very pronounced, has not more than 9 rows of horizontal spindles, as against 17 in *Cl. armata*;
(2) the armature of the calyx-wall is not markedly chevroned as in *Cl. armata*;
(3) the spicules of the eight 'points' on the retractile portion of the polyp are very markedly in chevron, an arrangement only approximated to in *Cl. armata*;
(4) the characteristic spindles with very minute knobs are only hinted at in *Cl. armata*, where prominently warty spindles predominate;
(5) the calyces of *Cl. ornata* may attain to a height of 5 mm., not including the retractile portions of the polyps; the calyces of *Cl. armata* are about 2 mm. in height.

Genus **Hicksonia**.

In 1886 Professor S. J. Hickson published a preliminary account of *Clavularia viridis* Quoy et Gaimard from Celebes, and pointed out the presence of remarkable tubes connecting the polyps, and the similarity of the expanded polyps, both in form and colour, to those of Tubipora. In 1894 he published a description of the interesting form and gave a beautiful drawing of the colony.

In 1906 Professor W. Kükenthal referred *Clavularia viridis* Quoy et Gaimard to the genus Anthelia which he distinguished from Clavularia because its polyps do not show any division into a calycine and a retractile portion. Whether the species described by Quoy and Gaimard was an Anthelia or not, there is no question that the form referred by Hickson to *Clavularia viridis* has a very marked calyx into which an anthocodial region can be retracted.

In 1901 Delage and Hérouard established a new genus Hicksonia for the form described by Hickson as *Clavularia viridis* Quoy et Gaimard on account of the connecting tubes which extend from polyp to polyp. They also emphasised the thickness of the mesoglœa and the dense system of "horny" fibres. It is difficult to determine the exact nature of this horny skeleton but it is apparently closely related to Keratin (Hickson, 1894). A mistake, however, was made in stating that the upper part of the polyp is without spicules, for these are abundant in specimens which Professor Hickson was good enough to identify with those he originally described.

Here we propose (1) to add a few details to Professor Hickson's description of *Clavularia viridis*, (2) to describe a distinctly new species (*Hicksonia köllikeri* Dean), and (3) to call attention to two interesting points regarding spiculation, namely (*a*), the occurrence of interlocked Telestid-like, almost antlered, forms which suggest the derivation of Telestids from Clavularids, and (*b*), the extraordinary variability in the details of the large warty spindles in what we feel compelled to regard as a single species (*Hicksonia köllikeri*).

1. *Hicksonia viridis* (Quoy et Gaimard). (Plate XII, Figs. 7 and 8).

Stat. 131. Karakelang Islands. 1 Ex.
Stat. 213. Saleyer. Reef. 2 Ex. Large, broken up colonies.

Specimens of this interesting type obtained in the Siboga Expedition, from Saleyer Reef, and Karakelang Island (no depth is recorded) agree closely with Professor Hickson's description in 1894 of *Clavularia viridis* Quoy and Gaimard. The general appearance and mode of growth of the colony is almost identical. The connecting stolons with average lengths of 2 to 3 mm. appear, however, to be rather shorter than those of the 1894 specimen; the whole colony seems to be more compact. The finest colony from Saleyer has a height of 7.5 cm. and diameters of 11.5 and 5.3 cm. The longest polyp had a length of 5.4 cm. and an average diameter of 3 mm.

The retractile portion of the polyps is leathery in texture, creamy white in colour, and differs from that of Professor Hickson's *C. viridis* in being dusted with innumerable very minute oblong, oval, or disc-like spicules, which are all divided into 2, 4, or several sectors by lines radiating from a central point. Average dimensions of the spicules are 0.03 × 0.03 mm.; 0.03 × 0.02 mm.

The spicules of the calyx are much more diverse than those figured and described by Professor Hickson. They include the following forms:

(1) long spindles covered with numerous short, simple warts, agreeing with the figure in Professor Hickson's 1894 paper. Maximum dimensions are 2.5 mm. × 0.17 mm. Some of the smaller spindles are almost smooth.

(2) large spindles, some with bifid, trifid, or complexly branched ends. They are densely covered with compound warts which vary in size from comparatively small dimensions to large, outstanding, irregular projections which interlock with those of adjacent spicules. These spicules vary in length from 2.5 to 0.8 mm. and have an average breadth of 0.15 mm.

(3) Especially interesting are irregular Telestid-like spicules often fused or interlocked, bearing a sparse number of compound warts and characterised by the irregular, smooth, branch-like projections, sometimes approaching an "antler" type. They strongly resemble the very distinctive forms found in some Telestos, especially those figured by Kölliker (*Icones Histiologicæ* 1895, p. 31) for *Clavularia riisei*, which is now regarded as a Telesto. The same type appears in the new species *Hicksonia köllikeri*, but was not found by Professor Hickson in his specimens of *Clavularia viridis*, where the spicules were much less variable. They would seem to indicate a not distant relationship between the genera Hicksonia and Telesto, already suggested by the general type of elongated "horny", hard polyp.

We have kept this interesting type in the same species as that of Professor Hickson's *C. viridis*, agreeing with him that though the spicules are considerably more variable and more numerous, there are not sufficient grounds for creating a new species. It should, however, certainly be separated off into the new genus Hicksonia (Delage, Traité de Zool. Concrète, 1901) as it shows such a distinctive feature as Tubipora-like tubular connecting stolons at various levels. Specimens of *Clavularia viridis* obtained by Professor Hickson from Torres Straits and from the d'Entrecasteaux group, showed a spiculation nearer that of our specimens: large spindles with compound warts had the ends sometimes bifurcated. These bifurcated spicules were found by him to be most frequent in the d'Entrecasteaux specimens, less frequent in the more western Torres Straits specimens, and none were found in the still more Western Celebes specimens. Our specimens, however, do not fit in with this east-to-west "simplification", as Saleyer is due south of Celebes.

2. *Hicksonia köllikeri* Dean. (Plate XII, Fig. 4, 5, 6; Plate XXII, Fig. 9).

Stat. 19. 8°44′.5 S., 116°2′.5 E. 18—27 M. River-mud, coral, coral sand.
Stat. 31. 8°47′.5 S., 115°39′.5 E. 310 M. Hard, stone.
Stat. 33. Bay of Pidjot, Lombok. 22 M. and less. Mud, coral and coral sand.
Stat. 37. Sailus Ketjil, Paternoster-islands. 27 M. and less. Coral and coral sand.
Stat. 58. Savu. Up to 27 M. Sand.
Stat. 60. Haingsisi. Reef.
Stat. 89. Kaniungan Ketjil. Reef.
Stat. 131. Beo, Karakelang Islands. 13 M. Mud and sand.
Stat. 142. Laiwui, Obi Major. Reef.
Stat. 144. Damar. 45 M. Coral bottom and Lithothamnion.
Stat. 163. Selee. 29 M. Sand and stone, mixed with mud.
Stat. 215. Kabia-island. 701 M. Stone.

Stat. 248. Tiur-island. Up to 54 M.
Stat. 250. Kur. Reef.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M. Mud, coral and Lithothamnion.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 18—45 M. Mud, coral and Lithothamnion.
Stat. 303. Haingsisi. Reef.
The specimens of this species are very numerous broken up colonies of which it is impossible to make a count.

There has now to be added to the genus Hicksonia another species *Hicksonia köllikeri*.

Several colonies of unusually large polyps we considered at first to be a new species of Clavularia. On further examination it was found that, though not so obvious in many of the specimens, the main distinguishing feature of the genus Hicksonia, namely the connecting stolons, was present. Some of the specimens seem to be young colonies with the polyps in process of becoming connected together by the stolons. There are also colonies of full-grown polyps which have no connections. As noted by Delage and Hérouard (1901), Professor Hickson found on the Celebes reefs full-grown specimens of *H. viridis* with no connecting tubes.

Many of the polyps are budding off small tubular stolons which arise at various levels from the calyx wall, though mainly from the lower half. Some of these have grown long enough to touch the body wall of a neighbouring polyp, but as yet have made no connection; the end of the stolon is merely firmly pressed against the wall. Other polyps are actually joined together by a stolon. In other cases a new polyp arises from this stolon, sometimes before the connecting stolon has joined up with another polyp, and while one end is still free.

The polyps arise from a complicated, irregular stolon which branches and forms a network in different planes; it frequently appears as if a stolon arising from the lower half of a polyp is really part of the ramifying basal stolon.

The polyps are substantial, many of them with a calyx of 20 to 29 mm. and with an apical diameter of 5 to 10 mm. The basal diameter is much less, generally about 2.5 mm. Many of the anthocodial upper portions of the polyps are completely retracted. The anthocodiæ are soft and membranous, but show eight hard ridges of the small, longitudinally-disposed spindles which tend to chevron arrangement at the base. In each ridge there are 4 to 6 pairs of these spindles. The tentacles bear on each side 16 to 20 simple pinnules in two rows. When the tentacle is in a contracted condition the pinnules crowd together, giving an appearance of numerous rows. The calyx is heavily armoured along the greater part of its length, but is generally softer and more flexible near the top. The rigidity of the whole varies considerably in different specimens. Eight main indistinct ridges can be seen, with further minor longitudinal striations. The colour in spirit is a greenish cream. No record is given of the colour of the living polyp.

The spicules of the calyx include the following forms:

(*a*) long delicate spindles with relatively few low conical warts; maximum length 2 mm.; average breadth 0.06 mm.; some of the smaller of these are almost smooth;

(*b*) stout spindles densely covered with compound warts, many showing bifid or branched ends; 0.8 × 0.15 mm.; maximum length 1.4 mm.; average breadth 0.13 mm.;

(*c*) irregular much divided forms, which interlock like those of some Telestos. A common size is 0.4 × 0.17 mm. (between the tips of the branches).

The spicules of the anthocodia and tentacles include the following forms:

(*a*) some very minute discs. Average diameter 0.015 mm.;

(*b*) more numerous small rodlets. Average dimensions 0.06 mm. × 0.02 mm.;

(*c*) straight and bent finely-warted spindles, some with the ends warted and branched. Average dimensions 0.85 mm. × 0.07 mm.

Some specimens from Lombok (5 to 12 fathoms) have the spindles of the calyx and the anthocodia so markedly branched and frayed at the ends that at first we considered them to represent a third distinct species. In view of the fact, however, that in the specimens described above as *H. köllikeri* the spindles occasionally branch, and that in other respects the specimens with frayed spicules agree closely with *H. köllikeri*, what is merely a difference in the degree of branching does not seem to warrant separating them into another species.

In these specimens the average height of a calyx is 28 mm. The apical diameter is about 7 mm., and this gradually tapers to a basal diameter of 2 mm. The general shape is club-like. The calyces rise in a thick crowd from a basal membrane and are practically touching one another. On the retracted tentacles there are crowded short pinnules, which leave no bare streak.

The spicules are very remarkable. They include the following: —

1.2 × 0.1 mm. on average. — (1) broad straight spindles densely covered with compound warts;
(2) the same curved;
(3) the same curved, and with bifid, trifid, and irregularly branched ends;

0.6 × 0.2 mm. — (4) the same curved, and with high compound prominences arising about the middle;

1.1 × 0.05 mm. — (5) slender, narrow spindles with low smooth prominences;

1.3 × 0.06 mm. — (6) slender warty spindles, bifurcate at one or both ends; or with 3 or even 4 branches;

0.23 × 0.03 mm. — (7) minute rodlets, slightly rough, from the tentacles;

0.06 × 0.02 mm. — (8) very minute finger biscuit forms from the pinnules.

Some other specimens (from Station 315) which we also refer to *H. köllikeri* have calyces 3 cm. in maximum height, with a protruding retractile portion of about 3—4 mm. They are therefore as large as those from Lombok, but do not show the abundance of terminally much branched spindles. A comparatively small number of spindles are slightly branched at their tips or at one tip, as also occurs in *H. viridis*. The calyx is so densely armoured that it acquires considerable rigidity. The retractile part is heavily armoured with eight vertical spiculose bands, consisting of longitudinally disposed spindles, with several rows in each band. In some cases the irregular growth of the basal stolon suggests a Telesto-like mode of origin of the polyps, and some of the irregular interlocking spicules are very like those of Telesto. These specimens in particular suggest an affiliation of Telesto to a Clavularia type as very probable.

Numerous very fine specimens from Kur show very markedly a somewhat trumpet-like shape of polyp. Thus one of the largest, with a height of 32 mm., had an oral breadth of 7 mm., whereas the base rising from the stolon was only 2 mm. across. One of the broad tentacles 6 mm. in length, shows a triangular bare streak, about 0.7 mm. in maximum breadth, on each surface, and on each side of that three rows of about 16 pinnules, the longest about 2 mm. in length.

Colonies of very young polyps from Stations 299 Rotti, 131 Beo, 60 Haingsisi, 19, 56 Savu and 142 show many small polyps which resemble ordinary Clavularia-like polyps without any interlocking Hicksonia stolons yet developed. These, however, may appear in a very young individual, as in a young colony from Station 58, Savu, where the polyps ranged from only 6—9 mm.. In one clump a 7 mm. high polyp gave off a stolon 2 mm. from its tip. This stolon united with another polyp near the base, and midway another polyp arose from it.

Comparison of *H. viridis* and *H. köllikeri*.

Both species show the main distinguishing feature of the genus Hicksonia, namely connecting stolons forming cross-bridges between the polyps at various levels. From these stolons fresh polyps may arise. The bridges are however more regularly short in length in *H. viridis*, so that the polyps remain more or less parallel throughout their length; the length of the connecting stolons in *H. köllikeri* varies to a greater extent, and the whole colony presents a less compact, more irregular appearance; the polyps are also considerably shorter. The colour in spirit of both species varies from an olive brown to a slightly greener shade. The basal stolons of *H. köllikeri* are more irregular, forming a deeper network than in *H. viridis*.

	Clavularia viridis	*Hicksonia viridis*	*Hicksonia köllikeri*
Maximum length of Polyp.	10 cm.	5 cm.	3.6 cm.
Average breadth of top of calyx.	...	3.5 mm.	6 mm.
Pinnules . .	...	Two rows of 25 to 30 on each side.	Two rows of 16 to 20 on each side.
Spicules of anthocodia.	None	Numerous minute discs, two, four, or multi-rayed. Average diameter 0.03 mm.	(*a*) Numerous small rodlets. Average size 0.06 mm. × 0.02 mm.
			(*b*) Straight and bent finely warted spindles. Some with the ends warted or branched. Average size 0.85 mm. × 0.07 mm.
Spicules of calyx.	Long spindles beset with numerous small spines and tubercles. Average size 2.3 mm. × 0.14 mm.	(*a*) Long spindles beset with numerous short simple warts. Maximum size 2.5 mm. × 0.17 mm.	(*a*) Long delicate spindles with relatively few short simple warts. Maximum length 2 mm.; average breadth 0.6 mm.
		(*b*) Large spindles, some with branched ends, densely beset with compound warts which vary considerably in size. Maximum length from 2.5 mm. to 0.8 mm. Average breadth 0.15 mm.	(*b*) Stouter spindles densely covered with compound warts. Maximum length 1.4 mm.; average breadth 0.13 mm.
		(*c*) Irregular, Telestid-like spicules. Common length 0.4 mm.	(*c*) Irregular, Telestid-like spicules; 0.4 mm. × 0.17 mm.

The upper portion of the calycine bodywall of *H. köllikeri* inclines to be more flexible and less rough than that of *H. viridis*, partly due to a slighter spiculation and partly to a lesser degree of horniness. The shorter calyx of the former is also more trumpet shaped, broadening out at the top. The anthocodia is more transparent than the absolutely opaque creamy anthocodia of *H. viridis*.

Spiculation: — A marked resemblance is seen between the spiculation of their calycine portions, most notably in the presence in both of the irregular Telestid type of spicule; the same three types of spicule are found in both, but the spicules of *H. köllikeri* are not quite so massive or so numerous.

A contrast is seen in the spicules of the anthocodia. In *H. köllikeri*, in addition to even more minute discs than those of *H. viridis* are found slender warted spindles arranged in eight ridges, and small rodlets.

Genus **Pachyclavularia**.

1. *Pachyclavularia erecta* Roule. (Plate II, Figs. 4, 8 and 9; Plate V, Figs. 6, 7 and 9; Plate XVI, Figs. 1 and 2).

For description see:

ROULE. Revue Suisse Zool. XVI, 1908, pp. 165—8, 3 figs.

(Compare STUDER. Sitzungsber. phys.-math. Klasse Akad. Berlin, 1878. Übersicht der Anthozoa Alcyonaria, p. 633, 2 figs.)

Stat. 19. 8°44′.5 S., 116°2′.5 E. 18—27 M. River-mud, coral, coralsand. 1 Ex. In fragments.
Stat. 33. Labuan Hadji, Lombok. 1 Ex.
Stat. 34. Labuan Pandan, Lombok. Shore. 2 Ex. in fragments.
Stat. 58. Savu. Up to 27 M. Sand. 1 Ex. in fragments.
Stat. 163. Selee Strait. 29 M. Sand and stone, mixed with mud. 1 Ex. in fragments.
Stat. 181. Amboina. 36—54 M. Mud, sand and coral. 2 Ex. in fragments.
Stat. 250. Kur. Reef. 1 Ex. in fragments.

Numerous colonies of bright purple polyps, with an average height of 6 mm. and diameter of 2 mm., rising from a much folded, often thick membrane (often 2 mm. thick) which spreads over a heterogeneous substratum of shells, sponge, and other materials, and which, being very brittle, tends to break up the colony into many fragments. A typical mass is about 4 inches in diameter and presents an extraordinary appearance. It agrees well with ROULE's figures of *Pachyclavularia erecta*, and is a very interesting form.

The calyx wall is very firm and stiff, longitudinally grooved, densely covered with longitudinally disposed spicules. Its oral margin is turned inwards and the purplish spicules are continued downwards for a short distance in lobes or tongues. From the retracted mouth the stomodæum continues, and from it in intermesenteric regions the plump finger-like tentacles, up to 2.4 mm. in length, grow out with their blunt tips turned in most cases downwards, and sometimes pressed into well-defined, doubtless temporary, pouches formed on the wall of the retracted polyp below the stomodæal region. Sections show that the columnar epithelium of the stomodæum is continued into the inside of the tentacle, surrounding the lumen. Thus the surface of the tentacles seen when a polyp is dissected is the endoderm. When the oral region of the polyp is protruded the tentacles must be individually evaginated. In some cases where tentacles are visible at the mouth of the calyx there is no hint of pinnules; and in such specimens there

is no convincing trace of pinnules to be seen when the downward curved tentacles are split or when sections are made. On better preserved specimens, however, with the polyps protruding, there are distinct, though extraordinarily primitive pinnules, just like minute pointed lobes. It is difficult to count them, but there are about four or five longitudinal rows on each side, and at least a score in each row.

The absence of pinnules is emphasised in BURCHARDT's *Clavularia amboinensis* (Alcyonaceen von Amboina (II), Jenaische Denkschr. VIII, 1898, p. 657). He says that even with high magnification no trace of pinnules was to be seen. But BURCHARDT's specimen was doubtless an Anthelia, and in any case it had nothing to do with ours. The stolons were reticulate, thin and flat; the polyps were limp, mostly half-retracted, and sometimes when fully retracted they were represented by small buds on the stolon. There were no spicules. Another form without pinnules, but almost certainly the same as BURCHARDT's species, has been described by BOURNE as *Acrossota liposclera* (Quart. Journ. Microscop. Sci. 1915, 1 pl.).

As a polyp-portion with stomodæum and tentacles is plainly drawn into a non-retractile stout calyx, our specimen should be referred to the genus Clavularia, not to Anthelia. Here we follow KÜKENTHAL's re-definition of the two genera, which seems to us to be thoroughly sound.

Our first inclination was to include our specimen in STUDER's *Clavularia rosea* with which it agrees in size (9—10 mm.), colour, stiff calyx, longitudinal ridges, rough spindles, retractile tentacles and oral disc. But STUDER described the tentacles of his specimen (from N.W. of Kerguelen) as 'short', while those of our specimens are notably long. Moreover, STUDER makes no mention of the irregular spicules. As STUDER's description is very short, we do not feel confident in including his *Cl. rosea* with our specimens, but the resemblances are certainly striking.

On the other hand our specimens agree entirely with *Pachyclavularia erecta* Roule, and we propose to re-emphasize this genus and include our forms within ROULE's species. In so doing we would lay stress on the peculiarities of our specimens as distinguished from ordinary Clavularias. The notable resemblances between our specimens and ROULE's are the following: (1) the thick composite nature of the basal membrane, (2) the large stiff polyps (calyces) longitudinally grooved, (3) the spindles with numerous compound warts; and (4) the rose-violet colour.

ROULE calls attention to the resemblance between his specimens and STUDER's *C. rosea*, but he does not mention the invaginated tentacles (nor any tentacles at all) nor the striking branched spicules. Through the courtesy of Professor ROULE and of Professor REVILLIOD, Director of the Geneva Natural History Museum, we have compared our specimens with ROULE's, and they are certainly the same.

The spicules — all purplish in colour — include:

(*a*) straight and curved spindles with high, very compound warts, markedly in zones, and standing out very prominently on the margin, 0.6 × 0.07 mm.

(*b*) very irregular, very warty forms, some bifid at one end, some triradiate, some with four branches and some more irregular still. Some of the warts are so compound that they might be called branched. The branches are from 0.1—0.3 mm. and up to 0.07 mm. in breadth.

(*c*) small spindles with distant compound warts, 0.24 × 0.03 mm.

Previously recorded from Amboina.

Genus **Sympodium.**

1. *Sympodium coeruleum* Ehrenberg.

For description see: KLUNZINGER, Korallthiere des rothen Meeres, 1877, p. 42, 1 fig.

Stat. 40. Kawassang. 12 M. Coral reef. 1 Ex. Fragments.
Stat. 61. Lamakera, Solor. Reef. 1 Ex.

Various rather dried portions of a bluish-green colony from Station 40, Kawassang, show small polyps arising from a basal membrane either singly or in small cushion-like groups. In most the tentacles are firmly contracted within the polyp, which appears as a low rounded swelling about 1 mm. in height and 1 mm. in breadth. The height of an expanded polyp is about 2.3 mm. but the specimens are obviously shrunken with drying. The short tentacles are stout straps, about 0.5 mm. long, bearing 2 rows of pinnules on each side, about 9 in a row. The calcareous bodies are small discs (very like those of a Xenia) which can be seen in abundance on the surface.

A colony from Lamakera reef shows the polyps more definitely blue in colour, arising similarly singly, or occasionally in small cushions from the basal membrane. They are nearly all expanded and reach a maximum length of 4 mm. with an average breadth of 1 mm.

Previously recorded from Tumbatu, East Africa, Red Sea, Zanzibar, Coetivy, Egmont.

2. *Sympodium fulvum* (Førsk.). (Plate XXIV, Fig. 7).

For description see:
KLUNZINGER, Korallthiere des rothen Meeres, 1877, p. 43, 1 fig.
MAY, Jenaische Zeitschr. Naturwiss., 1899, XXXIII, p. 52.

Stat. 315. Sailus Besar, Paternoster-Islands. Up to 36 M. Coral and Lithothamnion. 2 Ex.

A yellowish-brown encrusting basal membrane bears large superficial spindles forming a characteristic kind of network in the meshes of which lie the retracted polyps. Some of the spicules are visible with the unaided eye. The diameter of an expanded anthocodia is about 1.5 mm. The armature consists of a crown and points, the crown showing about three transverse rows, each point consisting of 2—3 pairs of spindles in chevron, one pair much larger than those flanking its base. The spindles are almost smooth, but many show very fine asperities. The longest was about 1 mm. in length. One of the polyps included a large embryo. It seems to us that *S. fuscum* Thomson & Henderson might have been included in this species.

As KLUNZINGER expressly noted, the basal membrane is in part elevated into hillocks which are covered with polyps, whereas WRIGHT and STUDER make a point of the fact that *S. fulvum* is one of those species in which there are not elevated Alcyonium-like groups. Some of the pieces from Station 315 show a very distinct hillock, which may rise to a height of 1.4 cm. The presence of numerous monaxon sponge-spicules in the preparation suggested an inquiry into the nature of the hillocks, and it was found that there was a core of sponge covered with the Sympodium membrane. It is possible that this was also the case with KLUNZINGER'S specimens.

Previously recorded from the Red Sea.

The geographical range is striking, and may be emphasised in a case like this where the identification of the species is particularly certain.

Family Tubiporidae.

Genus **Tubipora**.

1. *Tubipora musica* L. (Plate II, Figs. 10 and 12).

For description see: Hickson and Hiles, Willey's Zool. Results, IV, 1900, p. 493.

Stat. 60. Samau Island. Shore. Fragments.
Stat. 123. Biaru Island. 36—27 M. Stone and Lithothamnion-bottom. 1 Ex.
Stat. 250. Kur Island. 20—45 M. Coral and Lithothamnion. 1 Ex.
Stat. 303. Haingsisi, Reef. Fragments.
Stat. 313. Saleh-bay. Reef. 3 Ex.

Two well-developed young colonies from Station 313. The larger of the two has a height of 1.7 cm., a long diameter of 5 cm. and a short diameter of 3.5 cm. The larger is partly entangled with Polyzoon colonies of a Cellaria type.

A basal portion of a colony of *Tubipora musica* from Station 250 is overgrown by a vigorous specimen of *Capnella imbricata* (Q. G.).

A fragment with only two tubes from Station 131, Reef. Numerous young pieces, with many of the polyps expanded, from Haingsisi (Plate II, Fig. 10).

A fragment from Station 123 (Plate II, Fig. 12) consisting of a single tube, 1.3 cm. × 2 mm., at the top of which spreads a horizontal lamella or platform, 12 × 7 mm. showing the broken bases of five polyps arising from platform solenia, and not continued beneath it. The colour of this curious little fragment is of a more scarlet red than in the previous specimens, which are all a crimson red.

Previously recorded from Red Sea, Indian Ocean, tropical Pacific Ocean, West Indies.

Order ALCYONACEA.

Family Archicaulidae n. f.

Genus **Protodendron** n. g.

1. *Protodendron repens* (Thomson and Henderson). (Plate IX, fig. 3).
= *Coelogorgia repens* Thomson and Henderson.

For description see: Thomson and Henderson, Alcyonaria of Zanzibar, Proc. Zool. Soc., 1906, I, p. 436, 1 fig.

Stat. 123. Biaru-island. 36—27 M. Stone and Lithothamnion-bottom. 1 Ex.
Stat. 250. Kur. 27 M. 2 Ex.

Numerous small white encrusting specimens of an interesting type which seems to us to warrant a new genus and indeed a new family, at the base of the Alcyonacean series and annectent between Stolonifera and Alcyonacea.

The peculiar features are the following: —

(1) The polyps are long (up to 6 mm.), separate, and non-retractile, with completely infolded tentacles, but without calyx or operculum. Yet their cavities are in many cases continued into

a substantial stalk which represents the fused proximal parts of the individuals, as in a Xenia. The various stalks arise from a thickish membrane which encrusts pieces of sponge, coral, etc. In other cases or in other parts of the same colony, the polyps arise individually from the basal membrane, as in many Clavularians.

(2) Each polyp is heavily armoured and often glistening with longitudinally disposed spindles, more or less definitely in chevron, each double row ending in a point at the base of the tentacles. The tentacles show a dorsal transverse row of minute curved spindles, but all of them are inturned. There is no question of the heavily armoured polyps being retracted into the basal membrane or into the stalk.

(3) The characteristic spicules of the polyps and of the superficial coenenchyma are relatively substantial tuberculate spindles, sometimes straight, but usually curved (arcuate and lyriform). They bear in varying degrees of closeness short conical rather blunt tubercles, standing abruptly at right angles. These spindles differ in size, proportion of breadth to length, degree of roughness, and size of tubercles, which are sometimes compound and interlocking. The following measurements were taken: 0.95 × 0.05 mm.; 0.44 × 0.03 mm.

The spicules on the aboral surfaces of the tentacles are minute spindles with very small roughnesses, and with somewhat blunt ends. They are arranged in two sloping rows, irregularly in chevron. Average dimensions are 0.12 × 0.01 mm.

The specimens are much broken, the largest is 3.3 cm. by 1.3 cm., with a height of 1.7 cm.

The polyps of the oldest specimens arise from a composite stalk, as in most Alcyonacea, and this may have a height of 11 mm., with a diameter of 5 mm.

When a stalk-portion is developed above the encrusting base, it shows in cross section a continuation of the several cavities of the polyps which it bears, and the canal walls separating these cavities are supported by numerous typical spindles. The whole texture of the colony is stiff, though the heavily armoured polyps are flexible. It may be added that when there is a stalk portion the polyps arise from it at various levels and irregularly.

Our specimens agree in appearance and detail with those described by THOMSON and HENDERSON as *Coelogorgia repens* n. sp., but they include older stages which were not represented in the Zanzibar collection, and these show that the reference to Coelogorgia was an error. Thus they show that there is no possibility of distinguishing a primary axial polyp in the various clusters. Moreover, the typical species, *C. palmosa*, is arborescent; the walls of the axial polyp, surrounding the central coelenteric canal, are thick and include secondary canals. The spicules of our Siboga specimens do not show the compound warts characteristic of *Coelogorgia palmosa*, nor any tendency to form pseudo-clubs.

This interesting type cannot be referred to the Stolonifera if we adhere to the definition of this order, as including forms whose basal portion does not rise above the level of a *membrane* or *stolon*, from which the polyps arise individually. In the Siboga type a distinctive feature in the older colonies is that several polyps arise from a common stalk growing up from the basal membrane. It may be added that the Siboga specimens could not be referred to any known genus of the Stolonifera.

It seems to us that the occurrence of the polyps in bunches formed from a coherent continuation of their several canals, points to the inclusion of our type in the order Alcyonacea.

In other words, there is just the beginning of small stems which rise from a basal membrane. But the coenenchyma of these short stems or stalks is only incipient, since they consist of little more than the combined proximal portions of the cavities of the polyps, pointing indeed to what is characteristic of Lemnalia. From this genus our type may be separated off by the long heavily armoured polyps, by the presence of a basal membrane and the absence of a definite common trunk from which arise all the branches and all the polyps of the colony. Moreover the spiculation is quite different.

From Xeniidae the type may be distinguished by the absence of a common stout stem, by the origin of the polyps at irregular levels on the short stalks, and very distinctively by the spiculation. Yet it must be noted that some Xenias have a basal membrane connecting various fleshy stalks.

Conclusion: We regard the type Protodendron as annectent between Stolonifera and Alcyonacea, but occupying a primitive position among the latter, being in fact like Xenias in the making.

Previously recorded from Wasin (Zanzibar).

Family Xeniidae.

Genus **Xenia**.

1. *Xenia capensis* (Hickson).

For description see: Hickson, Alcyonaria and Hydrocorallinæ of the Cape of Good Hope, p. 70, 1 fig.

Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 M. Sand, coral and Lithothamnion. 1 Ex.

To this dimorphic species we refer a small specimen from Station 282. It agrees well with Hickson's description, save for having more numerous spicules and fewer siphonozooids. The total height of the colony is 1.7 cm.; it consists of a turgid firm stem 4.5 mm. in diameter with a slightly expanded basal attaching disc. At the rather swollen summit of the stem are found the not very numerous autozooids, with a few smaller siphonozooids at their base. The autozooids are short and proportionately broad, up to 4 mm. long and 1.8 mm. in flattened breadth; the tentacles bear short wart-like pinnules arranged in two rows on each side, about 9—10 in each row. As Hickson noted, these tend to become arranged in one row in the more fully expanded tentacles, but in our specimen the majority of tentacles are rather contracted, with the pinnules in two rows. The siphonozooids are not numerous as in Hickson's specimen. The maximum length is 2 mm. They show a simple tube with a very small mouth opening surrounded by 8 small lobe-like tentacles, or simply 8 faint indentations. In addition to the small siphonozooids are found young autozooid buds which from an early stage have much longer tentacles, showing even in small ones an indication of pinnules. This specimen disagrees with Hickson's in that there are small disc-like spicules to be found scattered powder-like over the autozooids and siphonozooids. The colour is whitish in spirit.

Previously recorded from Cape of Good Hope.

2. *Xenia florida* (Lesson).

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, 1902, I, Xeniiden, p. 648.

Stat. 40. Kawassang, Paternoster Islands. 12 M. Coral reef. 2 Ex.
Stat. 303. Haingsisi. Up to 36 M. Lithothamnion. 3 Ex.

With some hesitation we refer to this rather incompletely described species, specimens from Stations 40 and 303. The obvious points of agreement are (1) the arrangement of the pinnules in two rows on each side of the mid-line of the tentacle, as is found in few species of Xenia. There are 10—12 in each row in our specimen, but no number is given in the diagnosis of the species. (2). All the pinnules are very small and low. (3). The polyps are closely crowded together on the not very sharply defined summits of the branches. (4). The dimensions of polyps and tentacles are in good agreement, the polyps up to 7 mm. in length (breadth up to 2 mm.), and the tentacles up to 3.5 mm. in length.

The colour of the specimens from Station 303 is a rather opaque whitish colour; that of those from Station 40 is a more transparent light brown, while the texture of those from Station 303 is tougher, and less flaccid. In none are spicules present. No record of spicules is given in the diagnosis.

All the specimens except one show a stem giving rise to 3 or more branches. A curious unbranched very elongated specimen from Station 40 shows a flaccid stem 3.6×0.6 cm. which bears the crowded polyps at the summit. Several young buds are also present with very short tentacles. The other specimen from Station 40 shows a stem 1.7×0.5 cm., giving rise to two branches the longer of which, 2.4 cm. long, gives off a small branch 1 cm. long with two small terminal twigs.

A very similar type of branching is seen in the specimens from Station 303. In the largest specimen the trunk, 1.5×0.9 cm., divides into two main branches one of which gives rise to 3 twigs, at various levels; in the other longer branch one main twig is given off and 3 or 4 small clumps of polyps arise from the branch about half way up its length, so that a somewhat Cespitularia-like appearance results. The polyps are closely crowded together on the summits of the branches and twigs, which are conical with a not clearly defined edge to the polyp-bearing area.

Previously recorded from Pacific Ocean (New-Ireland, Port Denison).

3. *Xenia ternatana* Schenk.

For description see: A. SCHENK, Clavulariiden, Xeniiden und Alcyoniiden von Ternate. Abh. Senckenberg. Ges. XXIII, 1896, p. 64, 1 fig.

Stat. 50. Labuan Badjo, Flores. Up to 40 M. Mud, sand and shells according to locality. 2 Ex.
Stat. 258. Tual, Kei Islands. 22 M. Lithothamnion, sand and coral. 7 Ex.

The characters used in distinguishing certain different species of Xenia are somewhat unsatisfactory, but the specimens here referred to agree with *X. ternatana* Schenk in the following respects: — (1) the long limp pinnules (0.5 mm.) are arranged in two regular rows on each side of the tentacles (6 mm. long); (2) there are about a score in each row including the basal warts; (3) the calcareous bodies are very numerous, very minute, close-packed, circular discs, like red blood corpuscles.

The largest colony has a rounded, fleshy but rather flaccid, stalk 6 cm. in height and 1 cm. in breadth. It splits into two main trunks, each of which divides again and begins to bear polyps at a height of 6 cm. from the base. The polyps have an average height of about 12 mm. not including the tentacles, but they may attain a length of 23 mm.

A very similar specimen from Tual, but with a rather shrivelled stalk, has a total height of 6.3 cm. of which 4.6 cm. belong to the unbranched trunk.

Two small specimens from Station 50 Labuan Badjo we take to be colonies of this species with the polyps in a state of great contraction. The pinnules are in a bad state of preservation, but there appear to be two rows on each side of the mid-line. The polyps show numerous wrinkles in their contracted state and are much more rigid, standing more or less upright when taken out of spirit. The maximum length is 8 mm. The larger colony has a height of 2.9 cm., with a basal trunk, 7 mm. in height and diameter, which divides into two branches with the polyps arising from their summits. The consistency of the stem is stout and fleshy and the colour of the whole colony is a light brown.

Previously recorded from Ternate.

4. *Xenia viridis* Schenk.

For description see: A. SCHENK, Abhandl. Senckenberg. Nat. Ges. vol. 23, 1896, p. 62, 4 figs.

Stat. 33. Bay of Pidjot, Lombok. 22 M. and less. Mud, coral and coral sand. 3 Ex.
Stat. 174. Ceram. Reef. 6 Ex.

Several specimens of a grey-brown colour with greenish polyps seem referable to this species. The very minute spicules are circular and oval discs like red blood corpuscles, from 0.01—0.02 mm. across. They are very numerous, especially on the surface of the tentacles.

The polyps are short and broad, up to 5 mm. in length and 2 mm. in breadth, borne in some specimens rather closely crowded, in others sparsely on the surface of the stout smooth stem, which in every case but one, where it divides near the base, is unbranched. Average dimensions of a stem are 9 mm. high and 6 mm. in diameter.

The tentacles, up to 5 mm. in length, bear three rows of pinnules on each side of the mid-line, up to 15 or 16 in each row. These are low warts towards the base, but longer and more pointed towards the tip.

Previously recorded from Pacific Ocean (Ternate and New-Caledonia).

5. *Xenia umbellata* Savigny.

For description see: KLUNZINGER (1877) p. 39, 1 fig.; THOMSON and HENDERSON (1906) p. 410.

Stat. 33. Bay of Pidjot, Lombok. 22 M. and less. Mud, coral and coral sand. 2 Ex.
Stat. 34. Labuan Pandan, Lombok. 18 M. Coral reef. 2 Ex.
Stat. 40. Kawassang, Paternoster Islands. 12 M. Coralreef. 2 Ex.
Stat. 64. Djampeah. Up to 32 M. Coral, coral sand. 1 Ex.
Stat. 93. Sanguisiapo, Sulu archipelago. Lithothamnion-bottom. Sand and coral. (Formol preservation). 10 Ex.
Stat. 43. Sarassa, Postillon Islands. Up to 36 M. Coral. 3 Ex.
Stat. 60. Haingsisi. Shore. 1 Ex.
Stat. 250. Kur Island. 20—45 M. Coral and Lithothamnion. 2 Ex.
} Badly preserved specimens.

Of two specimens from Station 34, the larger shows a membranous base spreading over a sponge. From this base arise several stout fleshy stems, unbranched or giving off up to four branches. On the summits are borne the densely clustered polyps, of varied lengths up to 9 mm., with tentacles up to 7 mm. long. The pinnules when fully expanded are markedly long, slender and tapering, arranged in three rows on each side with a bare space between, right up to the tip, though near the tip it is reduced to a narrow bare line. There are about 16—20 pinnules in each row. The surface is covered with the numerous small calcareous discs, giving a powder-dusted appearance. The colour of the stems is a deep greyish cream with slightly lighter tentacles.

A specimen from Kawassang shows on the fully expanded pinnules three distinct rows of pinnules, about twenty to twenty-three in each row, extended but not to their fullest extent. The surface is covered with very numerous oval discs, like red blood corpuscles, 0.025 mm. by 0.015 mm.

A brownish colony from Station 64, Djampeah, with a firm stalk, 19 mm. in length and 3 mm. in breadth, bears elongated polyps peculiarly narrow and very limp. A common length up to the base of the tentacles is 1 cm., with a breadth of 0.4 mm. The tentacles have a length of about 5 mm. The specimen is very poorly preserved, but the surface is thickly beset with very minute oval and circular corpuscles, and the numerous pinnules are arranged in three rows on each side.

Numerous colonies from Station 93, Sanguisiapo are also growing on a sponge. One stem, 5 mm. in diameter, arising from the basal membrane, has developed, 6 cm. from the base, a secondary attaching disc with a length of 13 mm., which is fixed to another part of the sponge. Beyond it the stem continues free for 5 mm. and then is found the polyp-bearing summit.

Another small colony from Station 93, of a rather lighter cream colour, shows the usual features; the pinnules are very fully expanded and tapering.

Other colonies from Station 93, Sanguisiapo, some growing on a Turbo, show some stems with light brown colour, others with a faint greenish sheen, seen also on the pinnules and due to the spicules. They show similar characteristics of growth and pinnule arrangement (three rows of 20—22 on each side), but the maximum length of polyp is 5 mm., with a 4 mm. long tentacle.

Two light brown colonies from Station 33 have the same mode of growth, and though the preservation of the pinnules is bad, some tentacles are seen with very fully expanded tapering pinnules. In the majority of the tentacles the pinnules are broken off at their base, and appear as low warts.

6. *Xenia novae-britanniæ* Ashworth. (Plate XV, Figs. 1—4).

For description see: ASHWORTH, Willey's Zool. Results., Part 4, 1900, p. 518, 8 figs.

Stat. 152. Waigeu. Reef. 1 Ex.

A colony and fragments from Station 152 agree, as regards polyps, more nearly with *X. novae-britanniæ* than with any other species. They show very similar dimensions of polyp, which is of some significance in Xenia, (average length about 3 mm. very occasionally reaching

5 mm.; breadth about 1 mm.). They also agree in the number and arrangement of pinnules. The tentacles bear three regular rows of short pinnules, the lower ones wartlike, those near the middle of the tentacle being the largest and most conical. The pinnules on the two sides leave a clear bare space in the mid-line in the lower half of the tentacles, growing more closely together in the upper portion. There are about 10 in each row. The tentacles are all somewhat contracted and we measured none longer than 2.2 mm. (ASHWORTH's, 1.8—3.5 mm. long). They agree also in the very numerous small discs generally oval in shape found thickly throughout the whole colony. The colour is lighter, being a very opaque cream colour. It must be emphasised, however, that our specimens differ markedly from ASHWORTH's in that the stems are branched, while his were seldom branched; but we do not feel justified in establishing a new species on this.

The larger specimen with a total height of 2.7 cm. shows a short base, 1.7 cm. in maximum diameter, which divides practically at once into three main stems. These branch and branch again into the twigs, the conical summits of which bear the numerous polyps. Stem and branches are all firm and rigid, with a smooth surface.

Previously recorded from New Britain and Loyalty Island (Pacific).

7. *Xenia crassa* Schenk.

For description see: SCHENK, Abh. Senckenb. naturf. Ges. Frankfurt, XXIII, 1896, p. 58, 1 fig.

Stat. 34. Labuan Pandan, Lombok. 18 M. Coral reef. 16 Ex.
Stat. 37. Sailus Ketjil, Paternoster Islands. 27 M. and less. Coral and coral sand. 2 Ex.
Stat. 131. Karakelang Island. Reef. 1 Ex.

Two colonies from Station 37, the smaller with much contracted and rather dried polyps.

In the larger colony the low fleshy stem rises from a base, 3×1.2 cm., which has a membranous expansion over the piece of coral on which it has grown. It soon divides, at heights of about 7 mm., into several short thick polyp-bearing branches. As these are flabby and grow outwards rather than erectly, the whole colony has a very flattened appearance. The polyp-covered portion of the branches is strongly convex. The polyps are very numerous and closely packed together; the maximum length in a much expanded one is 8 mm., with a flattened breadth of 2 mm. The short pinnules, blunt or slightly pointed, but never sharply pointed, are arranged in 3 rows on each side of the mid-line, which is left bare only in the lower portion of the tentacle. There are 10—18 pinnules in each row.

The whole colony is very soft and flabby, though the minute spicules are very numerous. Colour of stem a deep cream, polyps and tentacles very light cream to white.

The smaller colony with a maximum height of 2.2 cm. has a base 3.2×1.1 cm. in diameters and a polyp-bearing region 4.6×1.2 cm.

A small colony from Karakelang, with a maximum basal diameter of 2.5 cm. and a similar height, shows the same strongly conical polyp-bearing summit, with polyps densely crowded, up to 5 mm. in length. The state of preservation did not allow of a count of the pinnules.

Numerous small colonies, and one larger one with a diameter of 6.8 cm., from Station 34, Labuan Pandan. They all show the typical very convex polyp-bearing summits, closely crowded polyps, the arrangement of the pinnules in 3 rows on each side of the tentacle, about 13—17 in each row. All are very soft and flabby and many show a basal membranous expansion which

in several is growing over a piece of Madrepore coral. The colour of the base and tentacles is a rusty brown or a rather greenish-cream while the tentacles are all cream-coloured or very slightly tinged with brown.

Previously recorded from Ternate and New Caledonia.

8. *Xenia garciæ* Bourne.

For description see:
BOURNE, Phil. Trans. Roy. Soc. London, V, 186*B*, 1895, p. 475, 3 figs.
ASHWORTH, Willey's Zool. results, Part 4, 1900, p. 524, 1 fig.

Stat. 152. Waigeu Island. 32 M. Lithothamnion-bottom. 8 Ex.
Stat. 250. Kur. Reef. 2 Ex.

Several small colonies from Station 152 agree well with BOURNE's and ASHWORTH's description and figures. They are only about 1 cm. in height with very slender little polyps up to 3 mm. in length, arising from the ends of the branches. The pinnules are short and finger-shaped, arranged in three rows of about 10 on each side of the mid-line. What is most typical in the arrangement of the pinnules is that the outer row from each side arises very near to the outer row of the other side, practically at the mid-line on the aboral surface of the tentacle, a most unusual feature in any Xenia, where the tentacles generally show a marked bare aboral streak. The circular disc-like little spicules are very numerous. The colour of our specimens in spirit is, in trunk and branches a bluish-grey, in polyps and tentacles cream.

Two withered little colonies from Station 250, Kur, show the same features, but a rather deeper greenish grey colour in the dried up stems.

Previously recorded from Ternate and Indian Ocean (Diego Garcia).

9. *Xenia ashworthi* Kükenthal.

For description see:
BOURNE, Phil. Trans. Roy. Soc. London, 1895, V, 186*B*, p. 476, 3 figs.
ASHWORTH, Quart. Journ. Microsc. Sci., 1900, XLII, p. 284, 2 figs.

Stat. 33. Bay of Pidjot, Lombok. 22 M. and less. Mud, coral and coral sand. 1 Ex.
Stat. 213. Saleyer. Up to 36 M. 3 Ex.

Three colonies of this dimorphic species from Saleyer, one of which shows an interesting case of parasitism. In the tallest specimen the stout unbranched trunk arises from a slightly expanded base to a height of 1.7 cm. with a maximum diameter, at the rather flattened top, of 1.5 cm. The surface of this stock is thickly covered with autozooids and with the much more numerous densely packed siphonozooids, which lie crowded together between the bases of the autozooids. The latter are contracted and wrinkled, not exceeding 6 mm. in length. The very fully expanded tentacles, not well preserved, are up to 6 mm. long, and bear three rows of pinnules on each side. At the expanded tips there appears as if two rows. A bare space is left between the pinnules on both sides up to the tip. The preservation in this specimen was not good enough to allow of a count of the pinnules. The numerous siphonozooids have an average height of about 2 mm., with simple tentacles, like small swollen lobes, without pinnules. These tentacles arranged round the small mouth are however, quite conspicuous, being whiter and rather swollen.

There is no possibility of mistaking a siphonozooid for a young autozooid bud, which from a very early stage shows longer tentacles with a distinct suggestion of pinnules. Some of these young autozooids are also found at the margin. The spicules are very numerous throughout the whole colony.

In another and well preserved specimen, the trunk has a height of 1.3 cm. and a maximum diameter at the top of 1.3 cm.

In this specimen the rather more numerous autozooids are in a better state of preservation, up to 7 mm. high, with the tentacles up to 6 mm. long, showing very clearly the pinnules arranged in three regular rows on each side up to 29 in a row, with a clear bare mid-streak up to the tip. The siphonozooids, less conspicuous in this specimen, are crowded between the bases of the autozooids. They do not exceed 1 mm. in height and for the most part are less than 1 mm. The lobe-like tentacles are less conspicuous, all that can be seen in most cases being eight indentations round the margin at the top. We were unable to detect any mouth opening in the smaller ones.

In various autozooids one or two curious abnormal stunted tentacles were observed, sometimes as small as 1.5 mm. long in a polyp where the other normal tentacles were up to 7 mm. in length. The tip of such an abnormal tentacle was bent round to the oral surface where a small swollen pocket was formed about 1 mm. across. The pinnules were reduced to mere lobe-like swellings on each side of the tentacle and were of course greatly reduced in number. When dissected, the small swellings or pockets at the tips of these abnormal tentacles were found to contain a small parasitic copepod, about 0.9 mm. long, (with no eye-spot) which generally lay in the same position, transversely across the pocket in which it snugly fitted. Several of these copepods carried egg-sacs.

The question arises as to whether the small pocket is simply an enlargement of the tentacle cavity at the tip into which the small crustacean has passed from within the polyp; or whether the pocket develops as a fusion of the oral surface of the tentacle with the sides of the tip which has enwrapped the copepod. In the great majority of the infected tentacles examined the whole appearance of the pocket strongly suggested the first alternative, and its cavity was definitely continuous with the tentacle cavity. Hence the copepod would certainly seem to have entered from within. In one interesting case, however, of a slightly stunted tentacle, 5 mm. long and with well-developed pinnules, the tip was found curled over and tightly gripping a copepod.

As far as we are aware, this is the first recorded case of copepods parasitic within the structure of an Alcyonarian.

Another specimen from Saleyer with an unbranched stock, about 1 cm. high and 8 mm. broad, shows similar badly preserved large autozooids and fairly numerous siphonozooids.

A colony from Station 33, Bay of Pidjot, we also refer to this species, though, unlike our other specimens, it shows a trunk dividing into two stems. The total height is 2.2 cm. The trunk, with a diameter of 4 mm., arises from a membranous expansion fixed to a piece of madrepore; 8.5 mm. from the base it divides into two stems, the summits of which bear the polyps. The larger stem has a maximum diameter of 6 mm. The autozooids are in a state of great contraction with wrinkled bodies. The tentacles, though in rather bad preservation, show

three rows of about 20 pinnules in each row on both sides. The siphonozooids are not very numerous, showing simply 8 slight indentations round the margin. Young autozooid-buds at all stages are also present. The spicules are numerous.

Previously recorded from Indian Ocean (near Zanzibar).

10. *Xenia membranacea* Schenk.

For description see: SCHENK, Abh. Senckenb. naturf. Ges. Frankfurt, XXIII. 1896, p. 60, 1 fig.

Stat. 34. Labuan Pandan, Lombok. Coral reef. 1 Ex.
Stat. 47. Bay of Bima. Shore. 1 Ex.
Stat. 60. Haingsisi. Reef. 1 Ex.
Stat. 91. Muaras. Reef. 2 Ex.
Stat. 142. Laiwui, Obi Major. Reef. 1 Ex.
Stat. . Unrecorded. 1 Ex.

A soft flattened colony from Station 60, Haingsisi, has a membranous base (3 mm. in diameter) spreading over a mass of Polyzoa and broken shell. From this arises the short (6 mm. high), unbranched stem which bears very numerous densely crowded polyps. These attain a length of up to 1 cm. The tentacles bear four rows of pointed pinnules with up to 24 in each row. The mid-line between the pinnules is bare save near the tip. Spicules are numerous, but the whole texture is very soft.

The colour is a rusty brown with cream-coloured tentacles.

A muddy cream-coloured colony from Station 47, Bay of Bima, shows the same low flattened type of growth, though in this case the low common base with a membranous expansion on one side is divided almost immediately into four short polyp-bearing branches, the maximum length of which is 11 mm. The diameters of the whole flattened colony are 6.1 and 4.7 cm. The tentacles are nearly all curved inwards, in a state of contraction, and these often show the pinnules contracted into five rows on each side. In normally expanded ones, however, the usual four rows are seen with about 20 in each row.

Another very similar flat colony from an unknown locality has the low membranous base divided into several short polyp-bearing branches, densely covered with polyps whose tentacles bear four rows of pinnules on each side, in rather bad preservation. The main diameters of the whole colony are 5.5 × 4.8 cm.

Two small colonies from Muaras Reef are completely dried up, but show a membranous base with the short stout stem covered thickly with polyps. These show four rows of pinnules on each side of the tentacle, about 17 in each row as far as can be seen in the dried state. The larger of the two has a maximum diameter of 19 mm.; its membranous base is spread over a piece of Madrepore coral.

A colony from Station 34 with a maximum diameter of 3.4 cm. shows a very thin membranous base slightly thickened at both ends, where the polyps are more thickly clustered.

A very badly preserved colony from Station 142 with a thin membranous base spreading over coral is probably referable to this species.

Previously recorded from Ternate, New Britain, Zanzibar.

11. *Xenia fusca* Schenk.

For description see: SCHENK, Clavulariiden, Xeniiden und Alcyoniiden von Ternate. Abh. Senckenberg. Ges. XXIII, 1896, p. 59, 1 fig.

Stat. 33. Bay of Pidjot, Lombok. 27 M. and less. Mud, coral and coral sand. 6 Ex.
Stat. 123. Biaru-island. 36—27 M. Stone and Lithothamnion-bottom. 1 Ex.
Stat. 282. 8° 25′.2 S.. 127° 18′.4 E. 27—54 M. Sand, coral and Lithothamnion. 1 Ex.

Several specimens from various stations agree most nearly with *X. fusca*.

In a typical one from Station 33 Bay of Pidjot, 3 cm. in total height, the stem splits near the base into three very smooth fleshy branches which re-divide at the summit into two short polyp-bearing twigs. The longest branch has a height of 10 mm. and a maximum diameter of 6 mm., while a twig is 5 mm. in length. Most of the twigs however do not exceed 3 mm. The soft flaccid polyps are very densely clustered on the summits, with numerous young buds near the outer margin, giving a markedly soft fluffy appearance. The polyps are up to 6.5 mm. in length and 1.5 in breadth, but a common length is 3 mm. and breadth 1 mm. The tentacles vary greatly in length according to the state of contraction, the average length being about 3 mm. In this specimen the most fully expanded tentacle had a length of 5 mm. and a breadth of 0.6 mm. They bear three rather irregularly arranged rows of 12—14 pinnules on each side of the mid line, which is often quite obscured. In a fully expanded tentacle the three rows may appear to merge into two, but three is the more typical. The pinnules of the upper half of the tentacle when fully expanded are rather elongated cone-shaped; near the base they approach to low warts. Numerous disc-like spicules are found throughout the colony. The colour is a greyish-cream.

In another colony from Station 33, 4 cm. in total height, the trunk gives rise to two main branches one of which gives off four polyp-bearing twigs at different levels, while the other gives off five twigs, which may redivide. The colour is a more definite dull brown.

A small withered colony from the same station is a dark brown.

A colony from Station 123, stained a slight pink with eosin, shows very fully expanded tentacles, on which the pinnules nearly all appear as if in 2 rows. The same type of branching and fluffy polyp clusters are seen.

A curious little colony from Station 282 shows two elongated stems, one with a slight basal disc, connected by a stolon which is continued by itself for 1.3 cm., and ends blindly. The rather flaccid stems are both about 3 cm. in length and very narrow in proportion, the maximum diameter being 3 mm. One gives off a polyp-bearing twig, three mm. from the tip. Both bear a terminal cluster of slender flaccid polyps which have tentacles with six rows of pinnules about 12—13 in a row. None of the pinnules are fully expanded. The maximum length of polyp is 5 mm. × 0.9 mm.

Previously recorded from Ternate.

Genus **Cespitularia**.

1. *Cespitularia cærulea* May.

For description see: MAY, Jenaische Zeitschr. Naturwiss., 1899, XXXIII, p. 90, 1 fig.

Stat. 40. Kawassang. 12 M. Coral reef. 1 Ex.
Stat. 306. 8° 27′ S., 122° 54′.5 E. 247 M. Sandy mud. 1 Ex.
Stat. 312. 8° 19′ S., 117° 41′ E. 274 M. Fine sandy mud. 4 Ex.

A yellowish colony from Station 306 shows numerous more or less parallel branches, which bear on their upper portions many long polyps. The total height is 8 cm., and the polyps are about 5 mm. in length, not including the tentacles. They are arranged somewhat after the fashion of an ear of wheat. There are no spicules. Certain polyps show numerous large unsegmented ova (0.6 mm. in diameter) with a definite membrane which is moored to the mesentery.

A portion of a badly preserved colony, growing from a broken base, to a height of 7.8 cm. bears in its upper region a number of polyps arranged as on an ear of wheat. The polyps are about 4 mm. in length; the pinnules are delicate and pointed, in a single row on each side of the middle line.

Previously recorded from the Indian Ocean (Kokotoni, near Zanzibar).

2. *Cespitularia tæniata* May.

For description see: MAY, Jenaische Zeitschr. Naturwiss,. 1899, XXXIII, p. 89, 1 fig.

Stat. 99. 6°7′.5 N., 120°26′ E. 16—23 M. Lithothamnion-bottom. 7 Ex.
Stat. . Unrecorded. 2 Ex.

Two specimens from an unknown locality show the distinguishing features of this species, which is near to but distinct from *C. cærulea*. The stem and branches are much flattened, the polyps are smaller than in *C. cærulea* with a maximum length of 2 mm., and the tentacles are also shorter, the maximum length in our specimen being 1.7 mm. The tentacles bear on each side a single row of about 15 finger-shaped pinnules.

In one of the specimens a membranous base with a maximum diameter of 1.7 cm. spreads over a piece of polyzoon-covered madrepore. From this arise two main stems, one unbranched, 2.2 cm. in length and bearing polyps on all sides, the other giving rise to four polyp-bearing branches, which are very soft, flattened and flexible. The total height of this short stem with the branches is 2.7 cm. There are no spicules.

The other specimen has a total height of 3.7 cm. arising from a base 9 mm. in diameter. From the short sterile stalk at a height of 4 mm. is given off a long and narrow rounded stolon (2.1 cm. in length with a diameter of about 1 mm.). This connects the main colony with a smaller one, 1.4 cm. in height with a basal diameter of 9 mm. The colour in both specimens is a dirty grey-cream colour.

Several small colonies from Station 99, the largest with a height of about 4 cm., show characteristics exactly similar to those of the above specimens.

Previously recorded from Indian Ocean (Mozambique).

3. *Cespitularia simplex* n. sp. (Plate XXIV, Fig. 3).

Stat. 40. Kawassang. 12 M. Coral reef. 3 Ex.

Three colonies from Station 40, Kawassang, require the establishment of a new species in the genus Cespitularia, which differs from the genus Xenia in that the polyps arise at various levels over the surface of the branches, and not in terminal clumps. The characteristics of these specimens approach most nearly to *Cespitularia mollis* (Brundin), disagreeing with that species however, in more than one respect.

The largest colony consists of a slightly thickened, almost membranous base with a maximum diameter of 1.9 cm. spreading over a jagged piece of madrepore coral. From this basal stock eight main polyp-bearing stems arise. Three of these are finger-like, unbranched; one divides near the base into two branches; and the others give off one to at most three, very short lobe-like branches. All are extremely flaccid and rather flattened, and are covered over their whole surface with the numerous non-retractile polyps. The longest branch has a height of 5.1 cm., with a maximum basal diameter of 1.2 cm. when flattened, and gives off on alternate sides three stumpy branches 7 mm. long. In another of the longer branches, 4 cm. long and covered on all sides with polyps, a curious secondary attaching disc is developed on one side at a point 2.8 mm. from the base of the stem. Here a membranous extension has been developed covering the surface of a small stone, 11 × 7 mm. in size. In this region on the upper side are given off two short opposite branches each about 5 mm. long. Similar secondary attaching discs developing on a branch are seen in both the other colonies, one firmly attached to the uneven lump of coral, rock and sponge on which the colony is growing.

The non-retractile polyps have an average length of 2 mm. and breadth of about 1 mm. A few were observed with a length of 3 mm. The tentacles are about 2 mm. long and bear a single row of short lobe-like and rounded pinnules.

The whole of the surface of branches and polyps (including the tentacles) is thickly dusted over with innumerable extremely minute rounded spicules. These when examined with a high magnification are seen to be minute finely sculptured scales about 0.01 mm. in diameter, rounded, generally with a rather uneven outline, some oblong in shape, others with a slight constriction at some point. But none were seen of the hour-glass or the quadruplet type figured by BRUNDIN for *C. mollis*. An optical suggestion of "twins" or hour-glass types is occasionally produced by two discs in contact or overlapping. Furthermore the spicules of *C. mollis* are very sparse, while our specimens are very thickly covered with these minute sclerites. The branching is also markedly different from that of *C. mollis*. The colour in spirit is an olive brown.

Family ALCYONIIDAE.

Genus **Nidalia.**

1. *Nidalia dofleini* Kükenthal. (Plate V, Fig. 5; Plate XXV, Fig. 5).

For description see: KÜKENTHAL, Japanische Alcyonaceen. Abhandl. K. Bayer Akad. Wiss. Supplement, Bd. I, 1906, p. 27, 2 figs.

Stat. 49a. 8° 23′.5 S., 119° 4′.6 E. 69 M. Coral and shells. 19 Ex.

Several specimens of this upright firmly-built colony, the best standing 4.7 cm. in height, with a maximum diameter of 1 cm. The colour varies from pale creamy-yellow to pinkish red, with the base generally pink.

The distinctive features of the species are

(1) the short sterile basal portion;

(2) the longitudinal grooves;

(3) the conspicuous calyces;
(4) the dense armature of the polyps, with transverse rings below, and sloping chevroned spindles above;
(5) the predominance of ovoid spindles with four or so zones of compound warts, and of other warted spindles which taper to one end or both. The polyps show delicate narrow spindles with low roughnesses.

Previously recorded from Sagami Bay.

2. *Nidalia granulata* (Gray).

For slight description (*Bellonella granulata*) see: GRAY, Proc. Zool. Soc. London, 1862, p. 35.

Stat. 240. Banda. 9—45 M. Black sand. Coral. Lithothamnion-bank in 18—36 M. 1 Ex.

Without any satisfaction we refer to this imperfectly described species a poor and small specimen from Station 240. It is about 1.5 cm. in height, with a maximum diameter of 5 mm. The surface of the polyp-bearing portion shows low 8-lobed calyces, somewhat as in *N. grayi* n. sp. The colour is ochreous. All the polyps are retracted and we were unable to see any polyp spicules.

The coenenchyma spicules are minute, some yellowish and some colourless, and include the following types: — minute double spheres, knobbed capstans, a few warty rods, and practically no spindles.

Formerly, if the identification be correct, from Bellona Reef, North Coast of Australia.

3. *Nidalia macrospina* Kükenthal. (Plate VIII, Fig. 7).

For description see: KÜKENTHAL, Japanische Alcyonaceen, Abh. K. Bayer. Akad. Wiss. 1906, p. 30, 4 figs.

Stat. 251. 5° 28′.4 S., 132° 0′.2 E. 204 M. Hard coral sand. 1 Ex.

A striking specimen, 6 cm. in height, by 1.2 in average breadth, agrees very closely with KÜKENTHAL's description. But there is only a hint of a stalk, and the colour of the preserved specimen is light brown.

The armature of the polyp consists of about four rows of transverse spicules, and eight points with about 4 pairs steeply disposed in each. The outer surface of the tentacles is heavily armoured, and very large warty spindles form the wall of the calyx.

Some of the external spindles attain a length of 4 mm.

Previously described from Japan.

4. *Nidalia rubra* (Brundin). (Plate XXIII, Fig. 6).

For description see: BRUNDIN, Alcyonarien aus der Sammlung Zool. Mus. in Upsala, Bihang K. Svenska Vet. Akad. Handl., 1896, Bd. XXII, Afd. 4, N° 3, Stockholm, p. 6, 2 figs.

Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 2 Ex.

With some hesitancy we refer to this species, a small rather shrivelled specimen from Station 289. The form and spicules of the colony agree well with BRUNDIN's description and figures, but the colouration differs. However *Nidalia cinerea* (Brundin), merged by KÜKENTHAL

into *N. rubra*, has colourless spicules. The colony is unbranched with a short sterile base and a polyp-bearing region closely covered with the low polyp calyces which give it a somewhat ridged appearance. The total height of the colony is 1.7 cm. and the average breadth is 5 mm. The calyces stand about 0.5 mm. in height and show faintly 8 furrows round the margin. Most of the polyps have their anthocodial portion completely contracted within the calyx, one or two are half expanded. All are very badly preserved; it was impossible to observe their spiculation, though a test showed that calcareous matter was present. The texture of the colony is firm, though it is difficult to say how much this is due to its rather dried condition. The colour of the specimen and of the spindles is a dull yellowish grey.

The spicules are very numerous and show the following forms:

(1) pointed spindles with relatively large outstanding warts. Average dimensions 0.2 mm. × 0.02 mm.;

(2) spindles very like (1) but longer, narrower and with smaller, simpler warts. Maximum length 0.3 mm.;

(3) small blunt-ended or pointed forms with 2 whorls of compound warts. Average dimensions 0.1 × 0.02 mm.;

(4) several quadriradiates of various sizes.

The colony bears some resemblance to *N. grayi* n. sp., but the spicules differ somewhat in form and still more in size.

Another specimen from the same station has a total height of 2.3 cm. and a maximum diameter of 5 mm. The polyps are all firmly contracted and the calyces appear only as slight elevations over the upper surface of the colony. The spicules agree with those of the preceding specimen.

The colour is creamy, slightly tinged with pink. The spicules are colourless or very faintly yellowish.

Previously recorded from Hirudo Straits, Japan.

5. *Nidalia duriuscula* n. sp. (Plate I, Fig. 8; Plate XXV, Fig. 6).

Stat. 51. Molo Strait. From 69—91 M. Fine grey sand; coarse sand with shells. 1 Ex.
Stat. 251. 5° 28′.4 S., 132° 0′.2 E. 204 M. Hard coral sand. 1 Ex.

A stiff cream-yellow colony, from Station 251, 3.3 cm. in height, with a very short sterile portion (about 1 cm. in height), and a slightly expanded attachment. The whole colony shows about 50 slightly protruding calyces.

The red polyps are retractile into yellow non-retractile 8-lobed calyces which are separated by intervals of 1—3 mm. The armature of the polyp consists of 4—6 rows of horizontally disposed spindles, above which there rise eight double points of rather smaller spindles, 3 or 4 pairs in a point, sloping in chevron. The polyp spicules are (*a*) reddish, slightly bent or twisted spindles with relatively few low warts, and (*b*) the same type without colour. Common dimensions are: — 0.48 × 0.05 mm.; 0.26 × 0.02. (*c*) Colourless straight spindles with larger simple or slightly compound warts; average dimensions, 0.21 × 0.04 mm.

The densely packed cortical spicules resemble those figured by Kükenthal for *N. dofleini*;

they are double spheres, and ovals covered with zoned compound warts. If a waist is indicated, as in the double spheres and some ovals, it is very narrow and inconspicuous. Common dimensions are: — 0.16 × 0.11 mm.; 0.09 × 0.09 mm.

As a young form of *N. duriuscula* n. sp. we are inclined to interpret a small specimen from Station 51, standing 1.4 cm. in height. (There is in this case some approach to *N. splendens* n. sp.). The ground colour is yellowish, and the polyps are red. But the calyx and the non-retracted portion of the polyp are each about 1 mm. in height. The polyp spicules are (*a*) slender straight or curved red spindles with comparatively few warts (0.32 × 0.03 mm.); the cortical spicules include (*b*) short broad spindles with many compound zoned warts (0.22 × 0.1 mm.); (*c*) ovoid and almost spherical forms beset with compound warts (0.1 × 0.08 mm.); (*d*) minute bodies like irregular capstans (0.04 × 0.02 mm.), and (*e*) warty crosses (0.2 × 0.15 mm.).

6. *Nidalia grayi* n. sp. (Plate II, Fig. 2).

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.
Stat. 310. 8°30′ S., 119°7′.5 E. 73 M. Sand, with few pieces of dead coral. 1 Ex.

If the genus Nidalia is defined as an Alcyoniid, unbranched, with a sterile stalk and a polyp-bearing region, with a distinct non-retractile calyx and a retractile upper polyp, the specimen here described is a Nidalia. But it differs from all known species, unless possibly *N. indica* (= *Bellonella indica*), in having no spicules in its retractile polyp-body.

A small and damaged specimen from Station 310 stands 1.9 cm. in height above its detached base, and has an average breadth of 5 mm.. It has a deep yellow colour. The upper portion is thickly beset with distinct but low calyces, 8-lobed; and the retractile polyp portion often projects for about a millimetre. The broken end of the basal part of the colony shows the closely packed large and small lumina of the long canals. The canal-walls show a large number of small spicules.

The spicules include the following types:

(1) very simple narrow rodlets, with two whorls of short knobs. A common length is 0.09 mm.;
(2) long fusiform types, with 4 or more whorls of warts, the two near the middle being larger, readily derivable from (1). Maximum length 0.15 mm.;
(3) minute capstans with knobbed ends, readily derivable from (1), by shortening the rod and prolonging the knobs; up to 0.6 mm. in length;
(4) larger capstans with more knobbed and irregular ends; up to 0.1 mm. in length;
(5) numerous quadriradiates of various sizes;
(6) some irregularly branched relatively smooth rodlets.

In a specimen from Station 164, there are very numerous capstans, some of which might be described as double spheres. That is to say, the two ends are more expanded and bear more prominent warts, while the median "waist" is very short. But there are gradations connecting them with type (1), which we regard as the starting-point. In the same specimen there are far fewer spindle-types (2), but there are many irregularly branched rodlets of type (6). In our judgment no systematic importance can be attached to the relative numbers of different types of spicule, especially when they are nearly related in their main structure.

7. *Nidalia splendens* n. sp. (Plate I, Fig. 7; Plate VI, Fig. 9; Plate XXV, Fig. 8).

Stat. 251. 5° 28′.4 S., 132° 0′.2 E. 204 M. Hard coral sand. 1 Ex.

A very handsome, approximately cylindrical colony, standing rigidly to a total height of 10 cm. There is a very short sterile stalk of about 2 cm. in height, and with a diameter of about the same. The polyps arise all round, but are distant from one another, a common vertical interval being 1 cm. The diameter of the stem about the middle of the colony is 1.3 cm. The calyces, 8-lobed at their margin, stand out very prominently to a height of about 5 mm., and are mostly directed upwards. The retractile upper portion of the polyp is when fully expanded about 4 mm. in height. As regards colour, the stem is creamy white and this is continued on the lower portion of the calyx; the rest of the calyx is coral-red, and the same is true of the retractile portion of the polyp, except that the tentacles are white. Elongated triangles of reddish spicules extend for some distance up the dorsal surface of the tentacles. Some of the polyps show numerous ova. The spicules include: — (*a*) stout colourless spindles with numerous very prominent warts, both simple and compound and often interlocking (0.4 × 0.06 mm.); (*b*) longer narrow red and colourless spindles with fewer warts (0.5 × 0.03 mm.); (*c*) spindles with warts in zones (0.3 × 0.06 mm.); (*d*) numerous small irregular and approximately spherical forms; and (*e*) a few quadruplets.

Genus **Metalcyonium.**

1. *Metalcyonium capitatum* Pfeffer.

For description see:

Pfeffer, Zur Fauna von Süd Georgien. Jahrb. Hamburg Wiss. Anstalt, 1888, VI, p. 50.
Kükenthal, Alcyonacea. Deutsch. Tiefsee-Exped. 1906, p. 46.

Stat. 213. Saleyer. Reef. 1 Ex.

An unsatisfactory small specimen of a dark brown colour shows a short sterile stalk and a lobed head, the total height being 12 mm. It has not the spiculation of a Sarcophytum, Sinularia, or Lobophytum, but agrees on the whole with Pfeffer's *Metalcyonium capitatum*. Almost all the spicules are somewhat rod-like spindles, of variable breadth in proportion to length, bearing not crowded, blunt or more tapering prominences. Two or three four-rayed forms were seen on the slide. There is no hint of dimorphism, but the specimen is poor.

Previously recorded from South-Georgia.

Genus **Lobularia**.

We propose to revive Savigny's genus Lobularia which has had a chequered history. By Klunzinger and others it was merged in the genus Alcyonium, from which it was again separated by Wright and Studer. But their view was not homologated; thus May regarded Lobularia as synonymous with Alcyonium.

No doubt the two genera are very closely allied, but it seems to us to be convenient to revive the genus Lobularia for those Alcyonium-like forms whose spiculation mainly consists of a multitude of small double-clubs or double-spheres, generally with a waist. Also characteristic are very minute finger-biscuit-like forms.

The Lobularias do not show any of the spindles and single clubs which often occur in Alcyonium. This difference in spiculation probably means more than any difference in the lobing of the colony, to which EHRENBERG attached importance, though it may be regarded as characteristic of Lobularias that the common basal trunk of the colony is very shallow, and bears numerous relatively simple and compacted lobes.

1. *Lobularia ceylonicum* (Pratt). (Plate XXIII, Fig. 2).

For description (*Alcyonium ceylonicum*), see: E. M. PRATT, Report Ceylon Pearl Fisheries, R. S. London, N° XIX, 1905, p. 257, 3 figs.

Stat. 273. Jedan Island. 13 M. Sand and shells. 1 Ex.

A creamy white tough colony, with a low capitulum, 11 cm. by 4.8 cm., with a total height of 4 cm. The surface of the capitulum bears numerous, irregularly-shaped lobes, some of which are cylindrical and others flattened. The texture is not fleshy, as in Miss PRATT's single specimen, but firm and slightly granular.

Our specimen otherwise corresponds closely to Miss PRATT's description of *Alcyonium ceylonicum*, e. g.

(*a*) in the small size of the crowded autozooids, about 13 to a centimetre;

(*b*) in the spiculation. The spicules are chiefly densely tuberculate dumb-bells with a distinct waist. A common size is about 0.12 by 0.1 mm.

The young forms show only a few tubercles at each end of the dumb-bell. Among the dumb-bells there are some forms with the waist reduced to a mere line, and an end view of these suggests a sphere. There are no minute finger-biscuit-like spicules, such as are common in other Lobularias.

Previously recorded from Galle, Ceylon.

2. *Lobularia digitulatum* (Klunzinger)

For description see: KLUNZINGER, Korallthiere des rothen Meeres, 1877, Part I, p. 24, 1 fig.

Stat. . Illegible. 2 Ex.

Two low-growing colonies of a greyish-white colour, covered with numerous compressed lobes like short fingers, but coalescing at their bases in groups. The top of each lobe bears 8—12 polyps. The height of the larger colony is 1.7 cm., and the top shows a length and breadth of 3.8 cm. and 2.4 cm.

Besides its narrow lobes like short fingers, longer than broad, this species is marked by (*a*) minute, narrow, elliptical spicules, with or without constriction, not roughly thorny; (*b*) narrow, minute, thorny cylinders; and (*c*) larger rough-ended dumb-bells, with variable length of waist, very like those of *L. sphærophorum*.

Dimensions of the spicules are as follows: —

(*a*) 0.05 × 0.02 mm.

(*b*) 0.06 × 0.02 mm.

(*c*) A maximum size of 0.01 × 0.06 mm.

Previously recorded from Red Sea.

3. *Lobularia globuliferum* (Klunzinger).

For description see: KLUNZINGER, Op. cit., p. 23, 1 fig.

Stat. 301. 10° 38′ S., 123° 25′.2 E. Rotti. Reef. 4 Ex.

Several cream-white specimens, of which the largest has a maximum height of 3 cm., with a length and breadth of 6.5 cm. and 5.5 cm.

Besides having numerous short white lobes, superficially somewhat flattened and mutually compressed, with close-set but relatively large polyps, this species shows as its most characteristic feature (*a*) a great abundance of dumb-bells of varied sizes with very marked neck, and heads covered with minute asperities, and corresponding exactly to those described and figured by KLUNZINGER; (*b*) there are also, but less abundantly, rough-ended dumb-bells with markedly rounded prominences; (*c*) there are also more cylindrical to spindle forms with zones of rounded warts, with neck absent or ill-defined.

Dimensions of the spicules are as follows:

(*a*) up to 0.06 × 0.03 mm.;
(*b*) 0.09 × 0.05 mm.;
(*c*) 0.09 × 0.04 mm..

Previously recorded from Red Sea.

4. *Lobularia pachyclados* (Klunzinger).

For description see: KLUNZINGER, Op. cit., p. 24, 1 fig.

Stat. 19. 8° 44′.5 S., 116° 2′.5 E. 18—27 M. River-mud, coral, coral sand. 1 Ex.
Stat. 163. Selee Strait. Up to 29 M. 1 Ex.
Stat. 193. Sula Besi. 22 M. Mud. 1 Ex.
Stat. 215. Kabia Island. Reef. 1 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. Rotti. Reef. 2 Ex.
Stat. 313. Saleh-Bay. Up to 36 M. Sand, coral and mud. 2 Ex.
Batavia, SLUITER leg. Zool. Mus. Amsterdam. 3 Ex.
Stat. . Unrecorded. 2 Ex.

A brownish white colony, with short stumpy secondarily lobed lobes, not compressed, with a maximum height of 1.9 cm., with a length and breadth of 4.7 cm. and 3.3 cm. respectively.

A large typical specimen from Station 313 has a maximum diameter of 15.5 cm., with a breadth of 10 cm., and a height of 4.7 cm. A small specimen from the same station has a maximum diameter of 2.8 cm. and a height of 1.8 cm.

This species belongs to the series with blunt finger-like lobes not crowded. (1) There are large double spheres, with numerous pointed roughnesses on the broad spherical ends, and in most cases with little waist; (2) smaller more cylindrical types, with less expanded ends, with a relatively long clear waist region (probably growth stages of the large double spheres); (3) numerous minute ovals or figures-of-eight, with or without a waist.

Dimensions of the spicules are as follows:

(1) a maximum size of 0.08 × 0.05 mm.;
(2) 0.05 × 0.02 mm.;
(3) 0.04 × 0.02 mm..

KLUNZINGER emphasises the large size of the spinose double-spheres, 0.08—0.096 mm. in length. The maximum size in the majority of our specimens was 0.08 mm.; but the agreement in form is perfect. In the small specimen from Station 313 the large spicules attained a length of 0.1 mm.

A specimen from Station 163 is slightly divergent as regards the knobbed "double-sphere" or "double club" type of spicule, for the smooth neck portion is longer and there is thus an approximation to the type characteristic of *L. brachyclados* which are nearer double-knobbed cylinders with a much longer smooth neck portion. But this specimen also includes the short-necked forms characteristic of *L. pachyclados*.

A small colony from Station 215 with a height of 2.8 cm. and diameters of 4.3 and 3.3 cm. has diverging non-crowded lobes which however are rather less stout, and redivide into a rather greater number of small rounded lobes than in the more typical specimens. The spicules agree well.

Previously recorded from the Red Sea.

5. *Lobularia sphærophorum* (Klunzinger).

For description see: KLUNZINGER, Korallthiere des Rothen Meeres, 1877, p. 22, 1 fig.

Stat. . Illegible. 1 Ex.

A whitish grey colony, 5.2 cm. long, by 5 cm. broad, with a maximum height of 1.8 cm.

This species belongs to the series with broad spherical lobes, flattened on the surface, and compressed against one another, often showing constriction. (1) The larger spicules are dumb-bells with rounded or pointed terminal roughnesses and a somewhat short smooth waist. (2) Numerous miniature dumb-bells occur, evidently young stages, often with a waist-portion much elongated. (3) The smallest spicules are opaque, finger-biscuit-like, or figure-of-eight-like, smooth or with minute asperities, with only a slight waist. The colour is greyish-white. There are about 8 polyps to 5 mm.

Dimensions of the spicules are as follows:

(1) a maximum size of 0.095 × 0.05 mm.
(2) 0.06 × 0.03 mm.
(3) 0.05 × 0.02 mm.

Previously recorded from Red Sea.

6. *Lobularia globuliferoides* n. sp. (Plate VIII, Fig. 4; Plate XXI, Fig. 5).

Stat. 125. Sawan, Siau-island. Up to 27 M. Stone and some Lithothamnion. 2 Ex.

A greyish-white colony with markedly rounded, broad and short lobes, touching one another. One of the lobes is produced into a curious tapering finger. The colony has a length and breadth of 2.5 cm., and stands 1.1 cm. in maximum height. The average apical diameter of a lobe is 0.6 cm. The polyps are large and sharply defined, with about 7 in a line of 5 mm.

Besides the short roundish lobes, superficially somewhat flattened, with contiguous sharply defined polyps, about 7 in a line of 5 mm., this species shows as its distinctive features, (*a*) large

thornless dumb-bells, with a very distinct neck, with the heads covered with extremely minute asperities; (*b*) minute forms with the same characters, often with a very long neck; (*c*) numerous dumb-bells with heads covered with somewhat blunt prominences. Some of the largest (*a*) forms begin to show marked terminal roughness, convergent towards the (*c*) type, though doubtless of different development. This species is closely related to *L. globuliferum*, but (1) the relatively smooth dumb-bells (i. e. with no more than minute asperities) are less numerous, while some of them attain a much larger size, and most of them have the heads less markedly defined off than in *L. globuliferum*; (2) there are characteristic minute dumb-bells, (*b*), with the narrow neck region disproportionately long; (3) the prominences of the rough dumb-bells are less rounded, though not spinose.

Another colony from the same station has a maximum diameter of 1.11 cm. and a height of 1 cm.

Dimensions of the spicules are as follows:

(*a*) a maximum size of 0.08 × 0.04 mm.
(*b*) 0.04 × 0.01 mm.
(*c*) a maximum size of 0.09 × 0.05 mm.

Genus **Alcyonium**.

1. *Alcyonium dendroides* n. sp. (Plate IX, Fig. 5; Plate XV, Fig. 7).

Stat. 37. Sailus Ketjil, Paternoster-islands. Reef. 1 Ex.

A large monomorphic species without the huge spindles characteristic of Sinularia and without any hint of siphonozooids may be referred to the genus Alcyonium.

The sterile trunk has a breadth of 13 cm. and a height before branching of about 6 cm. It gives rise to very substantial short branches, about five in number but pressed into one another. These bear secondary short branches, which give rise to a multitude of tapering finger-like lobes, more pointed than in *S. polydactylum*, with an average length of 1.5 cm. and breadth of 8 mm. They are thickly covered with completely retracted polyps. A cross section shows a very definite central canal, as is also seen in *S. polydactylum*. The finger-like lobes are smooth, like moistened leather, but they are very readily broken off. Even on the trunk the surface is only slightly rough, very different from a typical Sinularia.

The spicules include the following forms:

(*a*) numerous broad blunt spindles, covered densely with compound warts, and sometimes forked; up to 0.9 mm. in length and 0.2 mm. in breadth;
(*b*) much smaller slender spindles with less crowded tubercles, sometimes simple, sometimes compound; average dimensions 0.4 × 0.06 mm.;
(*c*) irregular shapes derived from (*a*) and (*b*);
(*d*) small approximations to clubs, with one end broader and more tuberculate than the other; 0.05 × 0.03 mm.; 0.07 × 0.04 mm.;
(*e*) numerous double spheres, sometimes double clubs, with dense tuberculation and little hint of a waist; 0.05 × 0.03 mm.;
(*f*) a few small irregular forms, including crosses; 0.07 × 0.04 mm.;

2. *Alcyonium molle* n. sp. (Plate VIII, Fig. 3; Plate XXIV, Fig. 4).

Stat. 60. Haingsisi. Reef. Lithothamnion in 3 M. and less. 1 Ex.

A whitish-grey colony with a short stalk portion (1.2 cm) and two main divisions bearing short finger-like branches. The polyps are very thickly disposed, and most of them are completely contracted. The canal walls are abundantly filled with relatively short broad warty spindles, but the whole texture of the pliable colony is soft. As might be expected the characteristic feature is in the spiculation. Most of the spicules are finger-biscuit-like, very warty spindles, some blunt, some tapering to a point (0.2 × 0.06 mm.). Besides these there are some slender spindles (0.16 × 0.02 mm.). Some spheroidal sandy inclusions occur somewhat deceptively. There are no clubs nor zones of warts. A few spindles show a slight indication of a girdle. Most of the warts are low hillocks and none seem to be compound. The colony is softer in texture than *A. simplex*; the zooids are less crowded; the spicules are all rougher; there is a frequent occurrence of blunt-ended spicules.

3. *Alcyonium rotundum* n. sp. (Plate XII, Fig. 1; Plate XXIV, Fig. 8).

Stat. 60. Haingsisi, Samau Strand. 1 Ex.

A cream-coloured colony standing 14.7 cm. in height, of which about 4.5 cm. goes to substantial sterile trunk. The diameters of the base are 5.5 cm. and 4.3 cm. The trunk gives off three main branches spread out almost in one plane. These divide and redivide eventually into numerous elongated finger-like lobes which tend to occur in somewhat flattened groups one behind the other, and may again bear minor lobes. A common length of a finger is 2.7 cm. The zooids begin to arise directly from the top of the trunk, and they cover the branches so densely that, as in *A. simplex*, there is practically no bare space. They show a diameter of about 0.8 mm. The consistency of the colony may be described as firm and fleshy, and the interior in the preserved specimen is very compact.

The distinctive feature of this species is of course in the spicules which differ markedly from those of *A. simplex* and *A. molle*.

They consist mostly of short, broad, rough ovoid and spindle-shaped forms, usually blunt-ended and rotund, but sometimes tapering, densely covered with prominences, sometimes pointed cones and sometimes obtuse slightly compound roughnesses. Average dimensions are 0.14 × 0.08 mm. An occasional cross occurs. There are no narrow delicate spindles. Many of the ovoids and spindles show the beginning of a median waist, but none of them could be confused for a moment with the minute dumb-bells which mark the genus Lobularia. But this species may be regarded as at the end of a series — *A. simplex*, *A. molle*, *A. intermedium*.

4. *Alcyonium simplex* n. sp. (Plate VIII, Fig. 2; Plate XXIII, Fig. 3).

Stat. 47a. Bay of Bima. Shore. 1 Ex.

A much branched greyish-white colony, with short, blunt, somewhat conical lobes entirely covered with crowded monomorphic zooids. A short sterile trunk, with basal diameters of 4.2 cm. by about 3 cm., gives off almost immediately three main branches, which at once subdivide

and eventually bear the rounded or bluntly conical lobes. The height of the colony is about 6.7 cm. and the greatest breadth 0.67 cm. The texture is firm but fleshy, with a suggestion of sliminess. The crowded zooids have a maximum diameter of 0.6 mm.

The spicules are very uniform. They are mostly very simple spindles with low conical prominences, and typically tapering ends. The following measurements were taken: — 0.28 × 0.04 mm.; 0.2 × 0.03 mm. The spindles vary greatly in the number of their prominences, and some are almost smooth. There are no compound warts. But there are also very narrow and short spindles, approaching rodlets.

Extrinsic inclusions of a sandy nature are frequent.

Genus **Daniela**.

Daniela koreni Koch.

For description see: KOCH, Alcyonacea des Golfes von Neapel. Mt. Zool. Station Neapel, vol. IX, 1890, p. 669, 4 figs.

Stat. . Unrecorded. 1 Ex.

An unfortunately damaged colony without any label appears to us referable to KOCH's rather puzzling *Daniela koreni*. The paucity of material prevents us from making a critical investigation, and we retain the type where KOCH placed it — among the Alcyonids.

The colony is almost translucent. A flaccid stem bears over a dozen delicate but large non-retractile polyps. The tentacles bear long pinnules, about fifteen on each side, in a single row. The total height of the fragment is 4.3 cm. The spicules are all delicate spindles, either smooth or with minute asperities.

The armature of the polyp approaches a crown and points. Below the origin of the tentacles there are a few minute spindles lying transversely; beneath these are four or five pairs of small spindles in chevron, and these are succeeded by three or four pairs of stouter spindles. At the base there is an indication of a ring of two or three rows.

Previously recorded from the Gulf of Naples.

Genus **Cereopsis**.

Cereopsis studeri Koch.

For description see: KOCH, Alcyonacea des Golfes von Neapel, Mt. Zool. Station Neapel, vol. IX, 1890, pp. 671.

Stat. . Unrecorded. 1 Ex.

Along with what we have called *Daniela koreni* there was, curiously enough, a fragment of another very translucent colony which bears a close resemblance to KOCH's *Cereopsis studeri*, included by KÜKENTHAL in the genus Gersemia.

A short stem, whose cross section is remarkably like KOCH's figure, must have borne about nine polyps. The armature is different from that of Daniela, since the bases of the tentacles are supported by strongly developed isosceles triangles of spindles in close chevrons, about eight pairs. The tentacles are folded down over the mouth and bear small, more or less

transversely disposed spicules. Over the whole surface of the polyp there is a dense covering of transverse spindles, which are covered with small roughnesses. Most of the spindles are slightly bent, some arcuate.

We have not material on which to base a judgment as to the position of either Cereopsis or Daniela, but we think that the two genera should be kept together.

Previously recorded from the Gulf of Naples.

Genus **Sinularia** (= *Sclerophytum*).

LÜTTSCHWAGER has shown in his Revision (Beiträge zu einer Revision der Familie Alcyoniidae, 1915) that the rules of nomenclature demand that MAY's name Sinularia (1898) should replace PRATT's more familiar name Sclerophytum (1903); and with this we must regretfully acquiesce. We follow the order of LÜTTSCHWAGER's revision: — *S. leptoclados*, *S. polydactyla*, *S. herdmani*, *S. querciformis*, *S. dura*, *S. rigida*, *S. whiteleggei*, *S. gardineri*, *S. capitalis*. Then follows: *S. flexibilis*, which we originally regarded as new, *S. tentaculata*.

1. *Sinularia leptoclados* (Ehrenberg). (Plate XI, Fig. 5; Plate XXI, Figs. 6 and 9).
   = *Alcyonium leptoclados* (M. E. and H.) Klunzinger.
   = *Lobularia leptoclados* Ehrenberg (1834).

   For description see: BURCHARDT, Alcyonaceen von Thursday Island, etc., II, Jenaische Denkschriften, 1902, Bd. VIII, p. 661, 2 figs.

   Stat. 60. Haingsisi. Reef. 1 Ex.
   Stat. 123. Biaru-island. 36—27 M. Stone and Lithothamnion. 1 Ex.
   Stat. 142. Laiwui, Obi Major. 45 M. Coral bottom and Lithothamnion. 1 Ex.
   Stat. 144. Damar island. 45 M. Coral bottom and Lithothamnion. 1 Ex.
   Stat. 181. Amboina. 36—54 M. Mud, sand and coral. 2 Ex.
   Stat. 213. Saleyer. Reef. 3 Ex.
   Stat. 240. Banda. 9—45 M. Black sand. Coral. Lithothamnionbank in 18—36 M. 2 Ex.
   Stat. 258. Tual, Kei-island. 22 M. 4 Ex.
   Stat. 301. 10° 38′ S., 123° 25′.2 E. 18—45 M. Mud, coral and Lithothamnion. 1 Ex.
   Stat. 315. Sailus Besar, Paternoster-islands. Up to 36 M. 1 Ex.
   Batavia, SLUITER leg. Zool. Mus. Amsterdam. 2 Ex.
   Stat. . Unrecorded. 2 Ex.

Numerous specimens, including luxuriant and massive colonies, from various stations, show the features of this species. All have a characteristic spiculation, and a branching type of growth, though a considerable amount of variation is found in the size and appearance of the branches, which include the thick blunt type figured by BURCHARDT, more slender elongated forms, and others with the twigs reduced to very small blunt outgrowths. The surface is like stiff leather throughout, but the branches break off very readily.

The spiculation is characteristic and includes:

(1) massive internal spindles with compound warts. These may attain a length of 4 mm. They are both straight and curved. There is an occasional bifurcation at one end. Breadth = 0.45 mm.;

(2) slightly narrower large spindles from the interior, with simple conical prominences; 2.5 × 0.24 mm.;

(3) very abundant on the cortex, short-stalked and long-stalked clubs, with upward pointing processes at the thick outer end, and sometimes with warts on the shaft, 0.3 × 0.04; 0.12 × 0.02 mm.;
(4) delicate narrow spindles, with distant warts. They are both straight and curved, 0.63 × 0.05 mm.;
(5) a few crosses 0.1 × 0.08 mm.

The short-stalked clubs begin as very simple forms, slightly dentate at the expanded end, and with two minute prominences near the base of the handle. With increase in size the club end becomes markedly knobbed, and a few more prominences develop at the end of the handle.

On a slightly different line are the long-stalked clubs, marked by the frequent irregularity of the less differentiated club end, and by the common twisting of the long stalk, which may also bear small warts.

A fine brownish colony from Station 315 has a total height of 7.7 cm., of which 3 cm. belongs to the unbranched trunk. This divides into several upright thick branches which give rise to the rather short blunt twigs (average diameter 4 mm.) where the retracted zooids are most numerous. The dimensions of the longest twig were 7 mm. × 4 mm. The branches and twigs are slightly flexible and somewhat brittle. This type bears a close resemblance to BURCHARDT's figure. The average distance between two autozooids on the twigs is about 1 mm.

A colony from Saleyer, 4.7 cm. in height, has twigs with an average diameter of 5 mm. and a maximum length of 1.3 cm.

Cream-coloured colonies from Amboina show a more slender and conical type of twig, with an average diameter of about 3 mm.

A rather withered brown colony from Haingsisi, with a height of 8 cm., would seem to have grown in sand to a depth of 3.1 cm., with in addition a disc of attachment (4.2 × 2.4 cm.) at the side of the stem, which had probably adhered to rock or coral.

Of various colonies from Tual some are very withered with thin flattened branches.

A large specimen from Station 213, Saleyer, 8.3 cm. high, with a deep brown stem and cream-coloured twigs, shows a stout rounded stem, 3.5 cm. in diameter, dividing after about 4 cm. into several upright parallel branches which bear a large number of small twigs, many of them simply small rounded lobes only 1 mm. high, none exceeding 7 mm. in length, with an average diameter of 2 mm. The spiculation is identical with that of the more typical specimens. Another fine colony, 8.4 cm. high, from the same station shows a similar type of growth. The diameters of the stem are 7.8 and 3.2 cm. Similar much smaller colonies from Stations 142, 240 and 301.

A puzzling shrivelled white colony from Station 123 bears a strong superficial resemblance to *S. querciformis*, which was also collected at that station. It is 3.8 cm. in height, of which 2 cm. is the rather slender stalk. The twigs are mostly elongated and narrow, up to 1.1 cm. in length and 3 mm. in breadth, with the polyps all in a state of retraction and situated about 1 mm. apart. In spite of the external resemblance to *S. querciformis*, the cortical clubs are very much smaller, and are markedly different in shape from those of that species, the whole spiculation agreeing with that of *S. leptoclados*.

A colony (locality unrecorded), with a height of 6 cm., shows branching and spiculation agreeing most nearly with this species, but the twigs are slightly less brittle and hard in texture.

Although these specimens are no doubt referable to what KLUNZINGER, MAY, and others have called *Alcyonium leptoclados*, we must agree with LÜTTSCHWAGER in refering them to the genus Sinularia (= Sclerophytum of PRATT). The spiculation shows the typical Sclerophytum type, (*a*) in the abundance of minute clubs in the cortex, and (*b*) in the frequency in the interior of huge massive spindles densely covered with compound warts producing an appearance of rows.

The important general result of comparing these numerous colonies is a demonstration of the close structural and spicular similarity of forms whose mode of growth shows remarkable diversity, from thick digitiform lobes to much more numerous, smaller, more rounded twigs.

2. *Sinularia polydactyla* (Ehrb.). (Plate XXII, Fig. 3).
(= *Alcyonium polydactylum* Dana).

For description see:
BURCHARDT, Alcyonaceen von Thursday Island und Amboina II, Jenaische Denkschriften, 1898, pp. 663—67, 3 figs.
PRATT, Alcyonaria of the Maldives, II, Fauna and Flora of Maldive and Laccadive Archipelagoes, 1903, p. 524.

Stat. 7. 7° 55′.5 S., 114° 26′ E. 15 M. and more. Coral and stones. 1 Ex.
Stat. 33. Bay of Pidjot, Lombok. 22 M. and less. Mud, coral sand, and coral. 1 Ex.
Stat. 37. Sailus Ketjil, Paternoster-islands. 27 M. and less. Coral and coral sand. 1 Ex.
Stat. 53. Sumba. Up to 36 M. Coral sand; near the shore mud. 1 Ex.
Stat. 58. Savu. Shore. 1 Ex.
Stat. 115. Kwandang-Bay. Reef. 5 Ex.
Stat. 127. Sangir-island, Taruna Bay. Reef. 1 Ex.
Stat. 142. Laiwui, Obi Major. 23 M. Mud or Reef. 1 Ex.
Stat. 152. Waigeu-island. 32 M. Lithothamnion-bottom. 1 Ex.
Stat. 193. Sula Besi. 22 M. Mud. 1 Ex.
Stat. 232. Amboina. Reef. 1 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion; sand and coral. 2 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M. Mud, coral and Lithothamnion. 2 Ex.
Stat. 313. Saleh-bay. Up to 36 M. Sand, coral and mud. 1 Ex.
Stat. . Unrecorded. 2 Ex.

A fine and typical specimen of this well-known species from Station 37, is 9 cm. in maximum height, and about 21 cm. in maximum length, with a basal breadth maximum of 10.5 cm. It agrees in every respect with the full descriptions given by BURCHARDT and Miss PRATT.

A typical colony from Station 193, 6.5 cm. in maximum height, 14 cm. in basal breadth, with numerous stumpy branches bearing digitiform lobes. Some of the large spindles show a zoning of the compound warts and an occasional middle line. Forks also occur.

A typical specimen with a sterile stem 3.5 cm. in height and numerous short finger-like branches which bring the total height to about 4.5 cm. The spicules include:
(*a*) large broad spindles densely covered with compound warts, up to 2.3 × 0.35 mm.;
(*b*) narrower spindles with simple warts (0.7 × 0.06 mm.);
(*c*) small clubs with irregular, often almost digitate ends (0.18 × 0.02 mm.).

A different mode of growth with slender tapering fingers marks a colony from Tual, dredge. It resembles BURCHARDT's Pl. LVI, fig. 5. It has the spiculation of an ordinary *S. polydactyla*, including what Miss PRATT called K-forms of large spindle.

A small specimen with compressed lobes, retracted autozooids, and normal spiculation, from Station 7, is harder and more stony, due mainly we imagine to the state of preservation.

A colony from Station 258, Tual, Kei Island, is slightly divergent from the type, and a similar smaller colony from an unrecorded locality. In the larger specimen a somewhat compressed sterile trunk gives off two main branches which bear digitate compressed lobes, most of which arise about the same level and do not spread out all round. The trunk rises to a height of 5.5 cm., with maximum diameters of 5.3 cm. and 2.2 cm. A common length of a finger-like lobe is about a centimetre and the median diameter about 0.5 cm. As KLUNZINGER suggested there is considerable variety in mode of growth, and it is perhaps more important to notice the paucity of irregularly branched large tuberculate internal spicules, most of them being typical spindles. The minute superficial clubs have somewhat pronounced terminal knobs projecting on the whole at right angles. There are no siphonozoids. The autozoids are small, very distinct, and tending to occur in crowded rows on the lobes. We cannot regard any of the peculiarities noted as more than variations.

A specimen from Station 299 shows some trifurcate or more irregularly branched massive spicules, a few incipient large crosses, and many incipient small crosses. To some extent it is possible to distinguish the species of Sinularia by the details of the small clubs. Thus in *S. gardineri* the knobbed projections at the broad end of the club are closely apposed; in *S. polydactyla* they stand out abruptly, more or less at right angles; in *S. querciformis* they are longer, more irregular, and much more divaricate.

From an examination of many specimens of *Sinularia polydactyla* we conclude that no importance can be attached to the nature of the lobes, whether finger-like or conical, and that the details of the minute clubs are also variable though the terminal projections are never so closely apposed as in *S. gardineri*, nor so divaricate as in *S. querciformis*. Yet, as one would expect, there are occasional approximations to both these types. Miss PRATT's *S. herdmani* may be distinguished by its extremely minute autozooids. The preparations of spicules from some of the colonies, such as that from Station 142, sometimes have the large spicules represented by spindles without any forking or branching; the occurrence of irregular forms seems to us to be quite fortuitous. A feature of the large spindles, as figured for instance by BURCHARDT, is the presence of a slight waist or crack transversely across the middle, connected no doubt with the mode of development.

Previously recorded from Red Sea, Ceylon, Maldives, Amboina, Zanzibar, Baui Island, Lucipara, New Hanover, Luzon, Jaluit, New-Guinea, Ternate, British New-Guinea, China Strait, East Madagascar, Mergui, Gulf of Cutch.

3. *Sinularia herdmani* (Pratt).
= *Sclerophytum herdmani* Pratt.

For description see: PRATT, Ceylon Pearl Oyster Report, XIX, 1905, p. 253, 2 figs.

Stat. 58. Savu. Reef. 1 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion, sand and coral. 2 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. Reef. 1 Ex.

A large colony from Station 301, 8 cm. high and with a maximum spread of 9.5 cm.,

shows characteristics approaching most nearly to those of *S. herdmani*. Close agreement is seen in the size and great number of the autozooids, the absence of siphonozooids, the spiculation, the texture and colouring, but the branching is considerably more irregular than that figured by Miss PRATT. From a short common basal stock, with diameters of 9 cm. and 4 cm. and a height of 2.3 cm., four stout, more or less upright trunks arise which give origin to lobes of varying size and shape, some digitiform with rounded ends up to 2.5 cm. in length by 7 mm. in breadth, others short, lobe-like or flattened.

The autozooids are extremely small and very numerous, regularly arranged over the surface of the capitulum and also found on the basal stalk at wider intervals. On the lobes there were counted up to 17 autozooids to 1 centimetre. (Miss PRATT recorded 20 to a centimetre). The majority are in a state of contraction.

The spicules include:

(*a*) numerous small clubs with warty heads and a small handle often with two simple warts, thus approaching the *S. leptoclados* type. Average dimensions are 0.08 × 0.03 mm.;

(*b*) some stouter clubs with fewer stouter and rougher warts at the head, and a stronger more warty stalk; average dimensions are 0.15 × 0.06 mm. In the roughness of the handle many of the clubs correspond more nearly with Miss PRATT's description than with LÜTTSCHWAGER's diagnosis;

(*c*) longer slighter clubs up to 0.15 × 0.03 mm., with a less distinct head;

(*d*) massive spindles covered with compound warts. The maximum length is 4 mm., but the majority do not exceed 2 mm. in length;

(*e*) small slender spindles bearing a few simple prominences. Average dimensions are 0.25 × 0.02 mm.;

(*f*) a few small spiny crosses.

The colony is hard and rather brittle, but yields slightly to the touch. The colour is creamy with patches of a yellowish brown.

A light-brown colony from Savu, with a height of 5.3 cm. and a maximum diameter of 8.5 cm., shows all the polyps retracted and appearing as very small darker brown specks on the surface of the branches and lobes.

Two colonies from Station 258, the larger with a height of 4 cm. and a maximum diameter of 9.6 cm. Both show a more open, less compressed mode of growth and lobes of a softer, almost rubbery texture. Both agree completely with our other specimens in spiculation and in size and number of the autozooids. The colour is brownish on trunk and lower branches, shading to almost white on the lobes, with the retracted polyps as small darker specks.

Previously recorded from Ceylon (Galle and Aripu); Amboina; and Nicobar Islands.

4. *Sinularia querciformis* (Pratt). (Plate XII, Fig. 2; Plate XXII, Fig. 2).

For description see: PRATT, Fauna and Geography of Maldive and Laccadive Archipelagoes, 1903, II, Part I, p. 530, 1 fig.

Stat. 64. Djampea. Up to 32 M. 5 Ex.
Stat. 123. Biaru-island. 36—27 M. Stone and Lithothamnion bottom. 3 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M. Mud, coral and Lithothamnion. 1 Ex.
Stat. 322. Bawean-island. 32 M. Coral. 1 Ex.

Colonies from Stations 123, 299, and Djampea are referable to this species. Each is comparatively slender and tall and shows a much branched capitulum; most of the branches have lobes which vary in length from short outgrowths about 1 or 2 mm. long to elongated narrow twigs 1 cm. long. The broadest twig was 4 mm. in breadth, but the average breadth is 2.5 mm. The polyps are monomorphic and fairly crowded. The spicules include enormous spindles up to 6 or 7 mm. in length and about 1 mm. in breadth, and numerous clubs (a common size 0.2 × 0.05 mm.). The relatively large heads of these clubs bear about half-a-dozen diverging sharp points which tend to curve upwards, a feature markedly characteristic of this species.

The largest of three white colonies from Station 123 rises to a height of 8.5 cm., of which 6.15 cm. is occupied by the sterile stalk, which has a maximum breadth of 1.3 cm.

One of three cream-coloured colonies from Djampea, 17 fms., with a total height of 4.8 cm., shows two sub-equal stems arising from a shallow somewhat convex stalk, probably surrounding a stone. This mode of growth somewhat resembles that figured by Miss PRATT. A shorter colony, proportionately stouter, 3.9 cm. high, from Station 299, shows a short common stalk from which three main stems arise, one of which early subdivides into two main branches giving origin to the numerous polyp-bearing twigs.

Two other white colonies from Djampea, at the same depth, (the larger with a height of 5.5 cm. and a stem with diameters of 1.3 and 0.5 cm.) show the same slender branched mode of growth and enormous spindles up to 7 mm. long; but the clubs are rather divergent from the more typical forms with diverging sharp points, the majority showing blunter warts more nearly at right angles and approaching the *S. polydactyla* type.

A brown withered small colony from Station 322 shows typical branching and spiculation.

Previously recorded from shallow water, Hulule, Male Atoll, Maldives, Gulf of Manaar, Zanzibar, Red Sea, Andamans.

5. *Sinularia dura* (Pratt).

For description see: E. M. PRATT, Alcyonaria of Maldives, Part II, Fauna of Maldive and Laccadive Archipelagoes, Vol. II, 1903, p. 528, 4 figs.

Stat. 133. Lirung, Salibabu-island. 36 M. Mud and hard sand. 1 Ex.
Stat. 250. Kur. Reef. 1 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M. Mud, coral and Lithothamnion. 5 Ex.

This very characteristic hard species is marked by the following features:

(*a*) enormous tuberculate spindles, up to about 7 mm. in length, are abundant, and sometimes can be seen projecting;

(*b*) the numerous small clubs have very strongly developed heads with knobs projecting at right angles to the shaft;

(*c*) the autozooids are proportionately few, and somewhat distant. (But in our specimens they are not 'very minute' as Miss PRATT describes. This is not borne out however by her figures). The siphonozooids are indistinguishable save as small caeca from the superficial transverse canals.

Two very different types of growth, both recorded in the original description, are seen in our specimens.

One type is cup-shaped, with a stalk; the other is not cup-shaped, but with a much lobed capitulum.

A cup-shaped specimen from Station 133 has a total height of 8 cm., with a stout stem, 3 cm. in average diameter, and a thin cup, 8.5 cm. by 6 cm., the margin of which is markedly notched and lobate. The retracted autozooids are most numerous on the margin and very sparse towards the centre of the cup. No siphonozooids are to be seen externally. The colour is light brown.

Several small colonies from Station 299 show a similar type of growth, with, however, a frilled rather than dentate edge to the capitulum.

The flattened specimen has a basal plate, with a length of 7.4 cm. and an average breadth of 3.2 cm., with a flat lobate margin to one side and numerous branching lobes arising densely over the whole surface. The total height is 3.1 cm. and the maximum height of a lobe is 2.5 cm. The autozooids are most numerous on the summits of the lobes. The colour is a deep cream.

The spiculation of all the specimens is identical and agrees in detail with the original description.

This is one of the most striking instances in the Collection of the unimportance of modes of growth, for the difference between the cup-form and the capitulum is so striking that it seems at first incredible that they can be referred to the same species, as is demanded by the identity of the very distinctive spiculation and of the general structure. It is of further interest that the same two types of growth should have occurred in the collection from the Maldives.

Previously recorded from Ceylon, Red Sea and Maldives.

6. *Sinularia rigida* (Dana) var. *amboinensis* (Burchardt).

For description see: Burchardt, Alcyonaceen von Thursday Island und von Amboina, II. Denkschr. med.-nat. Ges. Jena, 1898, p. 667, 2 figs.

Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M., Mud, coral and Lithothamnion. 1 Ex.

A flat encrusting colony from Station 299 shows the characteristics of this variety described and figured by Burchardt. The basal stalk is low and flat with a maximum diameter of 5.5 cm. and height of 1.5 cm. From this arise several branches, some short simple, digitiform, with rounded ends, others giving origin to short lobes or secondary digit-like branches. The majority are somewhat bent and twisted, with a gnarled appearance. The maximum length of a branch is 1.4 cm.

The polyps are monomorphic, nowhere very crowded, but more numerous on the branches than on the surface of the stem, where they occur at wide intervals.

The spiculation includes:

(*a*) long-stalked and short-stalked clubs; some with very densely warted heads, the warts usually short and blunt; others with a terminal wart and a single whorl of warts at right angles, approaching the *S. polydactyla* type. These vary from very small forms, 0.09 × 0.05 mm., to much larger ones 0.28 × 0.08 mm. The handle of the club on the long-stalked types varies from almost smooth to rough, and often shows a curious twist;

(*b*) large spindles up to 3 mm. in length, some showing a bifurcated end, densely covered with compound warts; others rather narrower with simple prominences;
(*c*) smaller spindles with fewer and less compound warts; 0.3 × 0.06 mm.;
(*d*) some small crosses;

The texture of the colony is very hard; the colour is cream coloured with tinges of a pinkish-brown.

Previously recorded from Amboina, Reunion Island, East-Africa.

7. *Sinularia whiteleggei* Lüttschwager (Plate VIII, Fig. 5).

For description see:
Lüttschwager, Revision der Alcyoniidæ, 1915, p. 13.
Erroneously as *Lobophytum tuberculosum* Quoy et Gaim., see also: Whitelegge, Alcyonaria of Funafuti, Part 1, Mem. Australian Mus. III, 1897, p. 217, 6 figs.

Stat. 37. Sailus Ketjil, Paternoster-islands. 27 mm. and less. Coral and coral sand. 1 Ex.

A deep cream-coloured, very hard colony, whose disc is covered with crowded low rounded lobes compressed into one another. The maximum dimensions are, 5.2 cm. in length, 4.3 in breadth, and 2.1 in height. The broad sterile trunk is 1.1 cm. in height, with basal diameters of 4.3 cm. and 2.5 cm. The siphonozooids are exceedingly minute.

The characteristic features of the spicules, well shown in Whitelegge's figures are (*a*) the numerous very blunt-ended tuberculate derivatives of the spindle type; (*b*) the divaricate tuberculate heads of the small clubs, which are often very unsymmetrical at their ends. Most of the large spicules are densely covered with compound warts.

While our specimen agrees with Whitelegge's description and figures, we are accepting Lüttschwager's conclusion that Whitelegge was mistaken in referring his specimen to the species of Lobophytum established by Quoy and Gaimard. In any case our specimen must be placed in the genus Sinularia (= Sclerophytum), not in the genus Lobophytum, because of the very numerous clubs and the relatively large size of the tuberculate spindles.

The following measurements were taken:

(1) blunt-ended forms, 0.85 × 0.28 mm.;
(2) tapering spindles, 0.29 × 0.06 mm.; 0.68 × 0.18 mm.;
(3) small clubs, average length 0.12 mm.

Previously recorded from Funafuti.

8. *Sinularia gardineri* (Pratt). (Plate VIII, Fig. 1; Plate XXII, Fig. 4; Plate XXIII, Fig. 8).

For description see: Edith M. Pratt, The Alcyonaria of the Maldives, 1903, Part II, p. 527, 1 fig.

Stat. 60. Haingsisi. Reef. 1 Ex.
Stat. 152. Waigeu-island. 32 M. Lithothamnion-bottom or reef. 1 Ex.

An interesting young colony, irregularly saucer-shaped, with a short stalk, and a margin with the beginning of digitate lobes, and with a single digitate process rising from near the centre of the saucer. The texture is hard and the consistency brittle. The colour is deep cream. The autozooids are inconspicuous but numerous. No siphonozooids could be seen.

The diameters of the shallow saucer are 3.7 cm. and 2.8 cm. The height of the stalk is not more than 1 cm.

The spicules include very numerous small clubs, some slender spindles, and characteristic large tuberculate spindles, which may be 2 mm. in length. This is shorter than Miss PRATT's description (about 3 mm. long), but this is probably correlated with the smaller size of our specimen. A young colony from Station 152 shows the same spiculation (notably small clubs with non-divaricate heads and a small whorl of knobs near the base of the handle).

Previously recorded from Maldives, Ceylon and Shubuk.

9. *Sinularia flexibilis* (Q. G.). (Plate XVI, Fig. 8; Plate XXIII, Fig. 5).

For description see: KOLONKO, Die Gattung Sinularia, Mt. Zool. Mus. Berlin, XII, 1926, p. 310, 1 fig.

Stat. 60. Haingsisi. 23 M. Lithothamnion in 3 M. and less. Reef. 3 Ex.
Stat. 127. Sangir-island, Taruna Bay. Reef. 1 Ex.
Stat. 213. Saleyer. Up to 36 M. Coral reefs, mud and mud with sand. 3 Ex.

Several specimens of this remarkable species, differentiated from all the others by the long narrow twigs, which bear the monomorphic zooids. There is a suggestion of a shock of elongated tentacles spreading profusely from the top of a trunk.

The largest specimen stands 18.8 cm. in total height, of which 7.7 goes to the sterile trunk. The base of the stiff trunk has a breadth of 8.3 cm. and a thickness of 5.2 cm. The trunk is very massive, but the branches are very pliable. About a dozen main branches may be distinguished, but they immediately give off secondary branches which bear the long tentacle-like lappets. In some cases a lappet is given off by itself almost from the base of a main branch and may attain a length of 7.8 cm. with no more than hints of bud-like twigs. A common length of an ordinary lappet is 5 cm. The lappets are densely covered with autozooids, each about half a millimetre in diameter; but there is no hints of siphonozooids. The trunk is densely filled with large warty spindles and the whole surface of the trunk is covered with a dense array of clubs. The general colour is creamy white. There is thorough agreement with KOLONKO's description.

One of the smaller of the three specimens from Station 213, 12.5 cm. in height, has a sterile trunk like an inverted cone, very remarkable in not showing any base of attachment. It suggests the blunt end of a Cavernularia! A still smaller specimen from Sangir has a total height of 10.5 cm. In the smallest specimen with a height of 6 cm. the longest lappet was only 1 cm. in length. (1) The large internal spindles are densely covered with large compound warts. In some of the narrower spindles the warts tend to be in transverse rows, but not in the broader types. A few of the spindles are bent across the middle, and a few triradiates and incipient crosses occur. An average size of spindle is 0.5×0.13 mm. They attain a length of about 1.8 mm. and a breadth of 0.3 mm. (2) The small clubs are characteristically short in relation to the breadth of the club-head, and occur in two types, (*a*) with the head consisting of diverging roughnesses, and (*b*) with the head approximately foliaceous. A common size of club is 0.1×0.05 mm. (3) there are also small symmetrical tuberculate spindles, a few tuberculate crosses, and minute multiradiate types almost stellate.

Previously recorded from Amboina, Samoa, Philippines, etc.

Genus **Sarcophytum.**

1. *Sarcophytum acutangulum* (Marenzeller). (Plate XVI, Fig. 6; Plate XXVII, Fig. 4).

For descriptions see:
KÜKENTHAL, Fauna Südwest-Australiens, Bd. III, 1910, p, 25.
MARENZELLER, Zool. Jahrb. vol. 1, 1886, p. 357.
PRATT, Ceylon Pearl Oyster Report Roy. Soc. London, 1905, XIX, p. 251, (as *S. contortum*).

Stat. 133. Lirung, Salibabu-island. Up to 26 M. Mud and hard sand. 1 Ex.
Stat. 142. Laiwui, Obi Major. Reef. 3 Ex.
Stat. 213. Saleyer. Reef. 1 Ex.
Stat. 240. Banda. Reef. 3 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M. 3 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 27—45 M. Mud, coral and Lithothamnion. 1 Ex.

A characteristic folded colony, from Station 240, with about a dozen main folds on the disc, and with secondary folds on these, so that the contour of a main fold sometimes suggests an oak leaf. The height is 8.5 cm., the maximum diameter of the disc is 7 cm., and the diameter at right angles to this is 5.4 cm. The base of the stalk has a diameter of 3.5 cm., and the distance from the base to the margin of the disc is about 8 cm. The disc is not spread out beyond the stalk in mushroom-like fashion.

As MARENZELLER notes, the siphonozooids are rather indistinct. The texture of the surface is gritty. The spicules agree entirely with those figured by MARENZELLER, but there seems to us to be a greater number of the very narrow, delicate spindle-types with relatively few thorns.

The typical adult form of this species is much folded, see Miss PRATT's figure of *S. contortum* and KÜKENTHAL's photograph of *S. acutangulum* in which he included Miss PRATT's species. But it is of considerable interest that the Siboga collection shows a number of growth-stages which lead from a simple mushroom-like type to the much plaited adult. As regards shape these young forms seem very different, but they agree inseparably as regards spicules, siphonozoids, and texture. Illustrations of the series have been figured, and the case is of so much interest that we have given details of a number of the gradations (Plate XXVII, fig. 4).

Of two colonies from Station 240, the smaller colony, like a button mushroom, 1.8 cm. in height, has a round capitulum with a maximum diameter of 1.2 cm., the stalk having a main diameter of 0.4 cm. The larger has a height of 2.5 cm. and a capitulum with diameters of approximately 1.7 and 1.1 cm. The margin of the capitulum is slightly lobate, as if showing the beginning of folding. In both, the autozooids evenly cover the whole surface about 1 mm. apart, and between them lies a single row of siphonozooids. The colour is a creamy grey.

The spicules show the following forms:

(*a*) strong, mostly straight spindles covered with compound or simple warts which in some tend to lie in whorls; up to 0.4 mm. in length and 0.07 mm. in breadth;

(*b*) more slender spindles, up to 0.4 mm. in length with a breadth of 0.02 mm., with fewer and more simple prominences;

(*c*) short clubs with broad heads covered with either blunt compound warts, some at right angles to the axis, or with sharp more upwardly projecting processes. A common length is 0.13 mm. with a breadth across the head of 0.05 mm.

Two young brown colonies from Station 142 Laiwui, Obi, show the same features, but owing partly to a greater state of contraction and partly to the state of preservation the autozooids and the siphonozooids are more distinct. The surface is moderately hard and rough.

The larger colony has a total height of 2.5 cm., of which 2.2 cm. is stalk. The main diameter of the stalk is 0.8 cm. The diameters of the rather twisted and elongated capitulum are 2.2 cm. and average of 0.8 cm. The number of siphonozooids around one autozooid is 6—9.

The smaller colony has a total height of 2.8 cm., of which 2.6 cm. is stalk. The diameters of the stalk are 0.6 and 0.2 cm. The capitulum has a diameter of 1 cm. The spiculation in both agrees with other specimens.

A very young, rather dried specimen from Station 299, Plate XVI, fig. 6, with a height of 1.2 cm., has the capitulum (0.8 × 0.6 cm. in diameter), bent down on one side on to the stalk, so that the specimen is flattened in one plane. The wrinkled stalk broadens from what is practically a pointed base to the edge of the disc. The numerous autozooids, which occur evenly over the whole surface, can be seen clearly, but the siphonozooids are very indistinct. The spiculation shows all the above types. The colour is brownish, and the surface very gritty.

Another specimen from Station 142 has a total height of 2.6 cm., of which 2.4 cm. is stalk. The diameters of the capitulum are 1.5 and 1 cm. The texture is softer than in the other specimens but there is otherwise very close agreement, with numerous autozooids, siphonozooids occurring in a single row between them, and an identical spiculation.

A stone coloured colony from Station 133, is somewhat saucer-shaped, with the margin slightly twisted, and with a total height of 1.2 cm., of which 1 cm. is stalk. The maximum diameters of the capitulum are 2.7 cm. and 1.5 cm., and of the stalk 2.9 and 1.2 cm. The texture is hard and the surface gritty. This specimen differs slightly from the other young specimens of *S. acutangulum* in its rather greater hardness, and in the occurrence of a heavier and coarser type of spicule than we observed in the other young forms. At the margin of the capitulum only one siphonozooid is seen between two adjacent autozooids, but toward the centre there are up to four siphonozooids between two autozooids.

The following are the types of spicules:

(*a*) long spindles covered with simple prominences. These attain a length of 0.52 mm. and a breadth of 0.02—0.04 mm. Many of the coarser forms are bent and twisted;

(*b*) coarser, shorter, spindles densely covered with compound warts, very often arranged in whorls. Dimensions up to 0.4 × 0.1 mm.;

(*c*) short clubs with large very densely warted heads, the warts being either compound, with the lower ones of the head in a whorl, or upward growing closely massed and with irregular prongs. Dimensions are 0.1 × 0.05 mm.; 0.17 × 0.07 mm.; 0.24 × 0.05 mm.

Previously recorded from Tonga; Port Hedland, N. W. Australia; Shark's Bay, Australia; and Ceylon.

2. *Sarcophytum ehrenbergi* Marenzeller. (Plate IX, Fig. 1).

For descriptions see:

MARENZELLER, Über die Sarcophytum benannten Alcyoniiden, Zool. Jahrb., 1886, I, p. 356, 2 figs.
BURCHARDT, Alcyonaceen von Thursday Island II, Semon's Forschungsreise, 1898, p. 677, 3 figs.
PRATT, Alcyonaria of Maldives, 1903, p. 508, 2 figs.

Stat. 115. Kwandang Bay. Reef. 7 Ex.
Stat. 213. Saleyer. Reef. 2 Ex.
Stat. 220. Binongka. Reef. 1 Ex.

Two interesting dark-coloured colonies from Station 213, Saleyer, with almost no stalk, and with a strongly folded capitulum spreading like a horse-shoe. The maximum expansions are 10.5 and 11.5 cm.; the maximum height is 4.4 cm.; in both cases there is a deep incision, like the mouth of the horse-shoe, where perhaps a piece of rock came in the way. The surface is smooth and leathery; the autozooids are numerous and well-marked; the siphonozooids are on the whole indistinct, but can be seen in patches with the naked eye. No importance can be attached to this feature, except in so far as it means that the siphonozooids are not large. The spicules agree on the whole with those figured by MARENZELLER and BURCHARDT; they include (1) a large number of rough clubs, (2) a large number of warty spindles, not very densely warted, (3) numerous very narrow spindles with few warts, (4) a smaller number of broader and blunter, short, warted forms. There are no massive spindles like those of *S. glaucum* and no densely warted ovals like those of *S. trocheliophorum*.

A young colony from Station 220, Binongka Réef, with a somewhat horseshoe-shaped curve and practically no stalk, has a maximum diameter of 5 cm. and at right angles to that a diameter of 2.5 cm. The surface is covered with retracted autozooids, about 1 mm. in diameter, and between these there are numerous siphonozooids, readily seen with the naked eye, and present, on an average, in the centre of the capitulum, to the number of four in a line between two autozooids. It appears to us that no systematic value can be attached to the relative numbers of autozooids and siphonozooids when the colonies are of different sizes. The shape and the amount of stalk seem to us to be merely modifiable growth characters. The spicules agree well with those figured by MARENZELLER, especially those of fig. 3, Plate IX. They include spindles and pseudo-clubs with compound warts, and the spindles vary considerably in the ratio of breadth to length. Many minute spindles show two zones with a few prominences in each.

Seven specimens from Station 115, of a darkish colour, with the disc never protruding far beyond the stalk, and often showing a single deep indentation, are referable to *S. ehrenbergi* if that be regarded as a variable species. The disc is thick and soft, with few folds. The autozooids are separated by intervals of about 2 mm., towards the centre of the disc.

Unlike those previously described as typical, these specimens show quite distinct siphonozooids, which are not very crowded. About 2—5 occur between two autozooids, whereas 6—7 are noted for the type and 9—10 for the variety *stellata*.

Except as regards the ends of the clubs, which do not appear stellate when seen end on, the spicules agree well with those figured by KÜKENTHAL for the variety *stellata*. Many of the spindles have relatively few prominences and these are usually conical knobs. There is also a short plump type of spindle with two zones of compound warts and warted ends. Distinct clubs are scarce in these specimens, most of them being more like a spindle with slightly thickened ends and few processes.

Previously recorded from Red Sea, Port Denison, Viti islands, Reunion, Ceylon, Maldives.

3. *Sarcophytum glaucum* (Quoy et Gaimard). (Plate VIII, Fig. 6; Plate XVI, Fig. 7).

For descriptions see:

MARENZELLER, Über die Sarcophytum benannten Alcyoniiden, Zool. Jahrbücher, 1886, p. 352, 3 figs.
E. M. PRATT, Alcyonaria of Maldives, 1903, II, p. 509, 2 figs.
BURCHARDT, Alcyonaceen von Thursday-island und von Amboina. Denkschr. Med.-Nat. Ges. Jena, 1898, p. 676, 3 figs.

Stat. 7. 7° 55′.5 S., 114° 26′ E. 15 M. and more. Coral and stones. 2 Ex.
Stat. 33. Bay of Pidjot, Lombok. 22 M. and less. 3 Ex.
Stat. 47. Bima. 13 M. 1 Ex.
Stat. 60. Haingsisi. 23 M. Reef. 2 Ex.
Stat. 123. Biaru-island. 36—27 M. Stone and Lithothamnion-bottom. 1 Ex.
Stat. 133. Lirung, Salibabu-island. Up to 36 M. Mud and hard sand. 2 Ex.
Stat. 142. Laiwui, Obi Major. Reef. 3 Ex.
Stat. 144. Damar. 45 M. Coral bottom and Lithothamnion. 2 Ex.
Stat. 162. Salawatti. 18 M. Coarse and fine sand with clay and shells. 1 Ex.
Stat. 174. Ceram. Reef. 1 Ex.
Stat. 181. Amboina. Reef. 1 Ex.
Stat. 213. Saleyer. Up to 36 M. 1 Ex.
Stat. 240. Banda. 9 to 45 M. Black sand. Coral. Lithothamnion-bank in 18—36 M. 5 Ex.
Stat. 252. Taam-island. 27 M. 1 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion; sand and coral. 2 Ex.
Stat. 273. Jedan-island. 13 M. Sand and shells. Stones. 2 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 M. Sand, coral and Lithothamnion.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 27—45 M. Mud, coral and Lithothamnion. 2 Ex.
Stat. 303. Haingsisi. Up to 36 M. Lithothamnion. 1 Ex.
Amboina. (1 in Amsterdam Mus., v. d. HUCHT leg.). 3 Ex.

A young colony, mushroom-like in form, with a stalk 1.4 cm. in breadth, rising to a height of 2.5 cm., and bearing a capitulum, with diameters 2.5 cm. and 2.3 cm. The colour is grey brown. The autozooids are very distinct, about 10 to a centimetre near the margin; the siphonozooids are numerous and well-defined.

The spicules of the stalk are chiefly broad heavily warted spindles with pointed ends, which we take to be one of the few clear differences between *S. glaucum* and *S. trocheliophorum*. A common length of these spindles is 0.4 mm. On the capitulum most of the spicules are relatively narrow spindles, usually but not always with simple prominences. There are also small pseudo-clubs, and a few crosses.

Miss PRATT notes as characteristic of this species — the slimy secretion, the green colour, the soft flexible texture, the large size of the autozooids, and the clearly defined siphonozooids. Our specimens are markedly smooth and soft; some are greenish; the autozooids are very long.

We are inclined to emphasise the abundant occurrence of three types of spicule:

(*a*) large substantial spindles variously covered by compound warts or conical prominences;
(*b*) delicate, slightly spinose, often slightly curved spindles;
(*c*) warty pseudo-clubs, many of them long in proportion to their breadth.

As an instance of the intergrading of genera we may refer to a number of young colonies which we regarded at first as belonging not merely to a different species, but to the genus Sinularia (Sclerophytum). But further examination has convinced us that they are merely

young forms of *Sarcophytum glaucum*, as marked for instance by the character of the clubs and by the size and number of the siphonozooids.

A young colony from Station 133, like a long-stalked mushroom, cream-brown in colour. The stalk rises to a height of 3.1 cm. and has an average diameter of 1 cm. It shows near its base numerous large spindles which mark *Sarcophytum glaucum* and, as Miss PRATT observes, approach those of the genus Sclerophytum. The capitulum is almost circular, with a diameter of 1.5 cm.

The autozooids, naturally few in number, have an aperture diameter of about 1 mm.; the siphonozooids are distinctly visible with a lens, and there may be two to four in a straight line drawn between two autozooids.

The spicules include the following forms:

(*a*) in the stalk, large spindles, pointed at the ends, densely covered with very compound warts, sometimes so densely that an appearance of rows results; they vary in length up to 1.4 mm., and in breadth to 0.17 mm.;

(*b*) abundantly in the capitulum, narrow spindles, with relatively few prominences, mostly simple; maximum length 0.8 mm., and breadth 0.07 mm.;

(*c*) in the capitulum there are also small pseudo-clubs, of diverse lengths, varying up to 0.4 mm. Both small spindles and clubs tend to be very closely appressed;

(*d*) in the stalk numerous short stout clubs, which tend to interlock. They are heavily warted, and on surface view look like the dumb-bells figured for *S. durum* by Miss PRATT; average length 0.1 mm. and maximum breadth 0.04 mm.

The large stalk spindles (*a*) may have simple prominences, but in most cases they are densely covered with warts which are extremely compound, like those figured for *S. densum* by Miss PRATT.

Another small specimen, from Station 123, with a narrow stalk of 1.9 cm. in height, and a disc-like capitulum with diameters 1 cm. and 0.7 cm., has similar superficial characters and approximately the same types of spicules. The stalk is softer, but the typical large spindles occur at the base.

A young specimen from Station 240, Banda, has a total height of 2.4 cm., of which 2 cm. is stalk. The capitulum has diameters 1.5 and 1 cm. The spicules are of the same general type, but (1) the narrow spindles of the capitulum are distinctly smaller and more delicate, (2) the large heavily tuberculate spindles of the stalk-base do not show the row-like appearance of tubercles, seen in other specimens. There is the same matting together of short stout heavily warted clubs. We are convinced that small degree-differences in strength or robustness of spicules are without systematic importance, especially in young colonies.

A young colony from Station 181 of a yellowish colour, a soft mushroom-like capitulum and a firm cylindrical stalk. The diameters of the capitulum are 1.8 and 1.3 cm. The diameter of the stalk is almost uniform, 5 mm., and the outline is nearly cylindrical. The height of the colony is 3 cm., to which the stalk contributes 2.3 cm. The capitulum is thickly covered with unretracted polyps, whose tentacles show on each side a single row of short blunt pinnules, supported by warty rodlets. Round the bases of the autozooids are numerous very distinct siphonozooids, filling up the intervals, but without crowding. The spicules show a very close resemblance to those figured by BURCHARDT for *S. glaucum*. A frequent size for the densely

warted spindles is 0.6 by 0.1 mm. What is divergent in this form is the cylindrical stiff stalk, much narrower than the capitulum.

Another young colony from Amboina Reef, like a button-mushroom, of a white colour, has a total height of 1.8 cm., of which 1.5 is stalk. The other dimensions of the stalk are 1 cm. by 0.8 cm. The diameters of the capitulum are 2 cm. and 1.6 cm. While the spicules are quite typical of *S. glaucum*, it should be noted that the siphonozooids, which are very numerous, are anything but distinct. This is another indication of the unimportance of such characters in classifying these forms.

Two other young colonies from Laiwui, Obi, of the button-mushroom type, of a brown colour, with very distinct siphonozooids, have the following dimensions. The larger is 1.5 cm. in maximum height, of which 0.9 cm. is stalk. The diameter of the stalk is 0.7 cm. The diameter of the capitulum is 2.2 cm. The smaller specimen has a maximum height of 0.8 cm., of which 0.3 is stalk. The diameters of the stalk are 1.1 cm. and 0.5 cm; those of the capitulum are 2.5 cm. and 1.8 cm. There are among the stalk spicules a number of broad, heavily warted, blunt-ended forms inclined towards the type that we regard as characteristic of *S. trocheliophorum*, but the great majority agree with MARENZELLER's figures of *S. glaucum*.

A small rather dried and hard specimen from Station 282, with a total height of 2.1 cm. and a small head, with a diameter of 8 mm., in which there is a notch on one side, has large spicules the majority of which are covered with simple prominences. Some however are covered with large compound warts.

Another very similar little brownish specimen from Station 273, with a brown stem 7 mm. in height and a disc, 7 mm. in diameter. The autozooids are crowded round the edge, 3 mm. apart in the centre, where there are up to 5 siphonozooids between each. These are very clearly seen. Also a similar small broken and dried colony from Amboina.

A small specimen from Station 142, Laiwui, Obi, agrees generally in its spiculation, but the large spindles of the stem do not exceed 0.85 mm. in length. Moreover the surface of the colony is rather leathery and in stiffer folds than in typical specimens. But a firm surface is noted as occurring in *S. mycetoides*, which is included by KÜKENTHAL within *S. glaucum*. The folding of this specimen from Station 14 is like that of SCHENK's *S. plicatum*, also included by KÜKENTHAL within *S. glaucum*.

Another colony of the button-mushroom type is 1.4 cm. high, with a disc 6.5 mm. in diameter. The siphonozooids are quite distinct. The largest of the warted spindles observed had a length of 0.7 mm. The colour is creamy grey.

Interesting on account of its form is a specimen from Bima, which consists of a narrow stalk about 9 cm. in height and 1.3 cm. in maximum width, and a disc, unfortunately broken, which probably had a diameter of about 3 cm. This obviously diverges from the ordinary form, but the spicules are quite typical.

Very strikingly different is a luxuriant colony, from Station 258, which we have figured. From a very short basal portion there rises a great horse-shoe-like capitulum with a much folded margin. The span from side to side is about 16 cm., the other diameter of the capitulum is 12 cm., while the height of the whole is only about 3.5 cm.

A small colony from Station 60 illustrates the variability of these species of Sarcophytum,

for though it has the typical clubs of *S. glaucum*, its large thickly warted spindles approach those of *S. trocheliophorum* especially MARENZELLER's variety *amboinense*. The point is that the large spindles are relatively shorter than many of those in *S. glaucum*, and many have blunt not tapering ends. But the other features of the colony are nearer *S. glaucum*. We regard a relatively broad, somewhat lemon-like, crowdedly warted large spindle as characteristic of *S. trocheliophorum*.

We cannot leave this species without noticing its variability, which BURCHARDT emphasised by establishing the varieties, *pauperculum* and *amboinense*. Two colonies may appear superficially different in colour, lobing of disc, retraction of autozooids, and length of stalk, and yet show precisely the same spiculation.

Previously recorded from Red Sea, Amboina, Port Denison, East Australia, Torres Straits, Viti Islands, Tonga Islands, Maldives.

4. *Sarcophytum gracile* Burchardt.

For description see: E. BURCHARDT, Jenaische Denkschr. VIII, 1898, p. 673, 3 figs.

Stat. 33. Bay of Pidjot, Lombok. 22 M. and less. Mud, coral and coral sand. 2 Ex.
Stat. 144. Damar. 45 M. Coral bottom and Lithothamnion. 1 Ex.
Stat. 213. Saleyer. Up to 36 M. Coral reef, mud and mud with sand. 3 Ex.

The larger of two specimens has a disc 3.2 cm. in diameter borne by a cylindrical stalk 5 cm. in height, with a diameter of about 9 mm. The colour is greyish-brown, and the texture rubberlike with a slightly gritty surface.

The features of this species, well described by BURCHARDT, are:

(1) the cylindrical unlobed disc, well-defined from the long cylindrical stalk;
(2) the large closely set autozooids and numerous small siphonozooids;
(3) the presence of large branched coarsely warted, often bent, spindles in the stem;
(4) the occurrence of coarse warty, bent clubs and wavy narrow spindles with relatively few low warts.

We find all these forms in our specimens, except the large warted bent clubs which are represented only by pseudo-clubs derivable from the coarse spindles by an expansion of one end. Several beautiful crosses occur.

A specimen from Station 144 is slightly less typical in having some of the large branched spindles with predominantly simple warts, and in having very numerous wavy narrow spindles with low warts.

Previously recorded from Amboina.

5. *Sarcophytum trocheliophorum* Marenzeller.

For descriptions see:
MARENZELLER, Über die Sarcophytum benannten Alcyoniiden, Zool. Jahrb. 1886, p. 359–62, 2 figs.
BURCHARDT, Alcyonaceen von Thursday Island, Jenaische Denkschr. VIII, 1898, p. 679–82, 5 figs.

Stat. 34. Labuan Pandan, Lombok. 18 M. Coral reef. 1 Ex.
Stat. 37. Sailus Ketjil, Paternoster-islands. 27 M. and less. Coral and coral sand. 2 Ex.
Stat. 47. Bay of Bima. Coral reef.
Stat. 47a. Entrance Bay of Bima. 1 Ex.
Stat. 53. Waingapu, Sumba. Reef. 1 Ex.

Stat. 60. Haingsisi. 23 M. Reef.
Stat. 81. Sebangkatan. 34 M. Coral bottom and Lithothamnion. 1 Ex.
Stat. 89. Kaniungan Ketjil. Reef. 1 Ex.
Stat. 91. Muaras Reef. Up to 54 M. Hard coral sand. Coral at anchorage. Lithothamnion near the Islands. 1 Ex.
Stat. 127. Sangir-island. 45 M. Fine, dark-coloured sand. 1 Ex.
Stat. 142. Laiwui, Obi Major. 23 M. Mud or reef. 1 Ex.
Stat. 144. Damar. 45 M. Coral bottom and Lithothamnion. 1 Ex.
Stat. 169. West coast New-Guinea. 57 M. Mud or reef. 1 Ex.
Stat. 279. Roma-island. Reef. 1 Ex.
Stat. . . Unrecorded. 4 Ex.

The characteristics of this species are:

(1) the margin of the disc is much convoluted, but the folds are not numerous or high; yet the degree of folding depends largely on age and size;

(2) the surface is smooth and rubbery, the openings of the siphonozooids are only slightly depressed;

(3) there are about 6 autozooids to a centimetre on a large colony, but 8 or more in a small colony, which shows that this character is very unimportant.

The spicules include:

(*a*) numerous broad, almost oblong, cylinders with in most cases two median zones and two terminal clusters of very large compound tubercles; in a minority there are three zones. Average dimensions are 0.25 × 0.1 mm. In some of the practically oval multi-tuberculate spicules there is a slight suggestion of a median waist, and thus there is an approximation to a double sphere;

(*b*) numerous slender spindles, with relatively few conical prominences, in most cases simple, 0.27 × 0.02 mm.;

(*c*) forms intermediate between) (*a*) and (*b*), 0.25 × 0.06 mm.;

(*d*) somewhat indefinite clubs, bearing more numerous prominences at the broader end, 0.1 × 0.04 mm.;

(*e*) small irregular crosses;

(*f*) a few almost smooth small spindles, 0.08 × 0.01 mm.

Of the specimens from Station 37 the larger colony stands 6 cm. in maximum height, and has a disc with a length of 17 cm. and a breadth of 10.5 cm. The colour is light brown.

The smallest colony stands about 2.5 cm., and the dimensions of its disc are 5 cm. by 2 cm.

A small brownish mushroom-like colony of this variable species from Kaniungan Ketjil stands 2.5 cm. in maximum height, of which 2.1 cm. go to the stalk. The diameters of the disc are 1.8 cm. and 1 cm. The spicules of the stalk consist largely of broad spindles and cylinders, chiefly rounded at the ends, densely covered with compound warts, occasionally with a median waist. We are regarding the presence of broad heavily-warted round-ended, or obtuse cylinders as diagnostic of this species, as compared, for instance, with *S. glaucum*. On the capitulum there are numerous narrow spindles with prominences not very crowded, usually simple cones, occasionally compound.

A compact brown colony, from Station 127, with a much folded disc (8 main folds) overarching a substantial trunk, agrees well with the descriptions given by Marenzeller and

BURCHARDT. The spiculation is practically identical, and there seems little importance in the varieties distinguished.

The maximum height is 8 cm.; the longest diameter of the disc is about 9 cm.; the longest diameter of the attaching base is about 6.5 cm.

A small colony from Station 279 Roma, along with a larger colony of *S. trocheliophorum* var. *minus*, is rather harder and less rubbery than is usual in this species, as is the other specimen, perhaps due to previous drying. The autozooids are very clear, up to 10 to a centimetre. The siphonozooids are small and indistinct, generally one between two autozooids, but occasionally two or three. The sterile stalk has a height of 2 cm., and the projecting disc with a slightly folded margin has diameters of 3.1 and 2.4 cm.

A young mushroom-shaped colony with a total height of 2.3 cm., of which 1.9 is stalk. The other dimensions of this substantial stalk are about 2 cm. by 1 cm. The diameters of the capitulum are 2.5 cm. and 2.3 cm.

Previously recorded from Red Sea, Amboina, Tonga Islands, Port Denison (Australia).

6. *Sarcophytum trocheliophorum minus* n. var. (Plate II, Fig. 11, Plate XXII, Fig. 5).

Stat. 50. Labuan Badjo, Flores, shore. 2 Ex.
Stat. 60. Haingsisi. 23 M. Lithothamnion in 3 M. and less.
Stat. 89. Kaniungan Ketjil. Reef. 1 Ex.
Stat. 115. Kwandang Bay. Reef. 9 Ex.
Stat. 131. Beo, Karakelang Islands. 13 M. Mud and sand. 1 Ex.
Stat. 213. Saleyer. Up to 36 M. Coral reefs, mud and mud with sand. 1 Ex.
Stat. 240. Banda. Reef. 2 Ex.
Stat. 252. Taam-island. 9—36 M. 2 Ex.
Stat. 279. Roma-island. 36 M. Mud and sand. 1 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M. 4 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 22 M. Mud, coral and Lithothamnion. 2 Ex.

It has seemed to us necessary to establish a new variety for numerous specimens which agree on the whole with *S. trocheliophorum* Marenzeller, but differ in the following respects:

(*a*) there are none of the large lemon-shaped multituberculate spicules;

(*b*) the majority of the more or less oval spicules show two median zones of low warts and warts at each end, but these warts are very often simple, and the whole spicule is, as it were, arrested at a young stage;

(*c*) the margin of the disc is much less folded and projects less; and the majority of the colonies show a deep somewhat reniform incision at one side. Among the younger colonies there are fungiform specimens with the margin of the disc entire.

It may be noted that the variety and the more typical form may occur at the same station, but the differences are not growth characters, being seen on large and small specimens alike.

Interesting on account of its form, but otherwise typical, is a colony (figured) from Station 60, Haingsisi. Rising from an expanded common stalk, there are three independent stalked capitula, the largest of which has a disc of 4.9 cm. by 3.4, borne on a stalk about 2.4 cm. in height and 2.8 in maximum diameter. The two larger capitula show very markedly the characteristic lateral incision, while the third shows it incipient.

A specimen from Station 279, Roma, shows the characteristic spiculation but, perhaps due partly to drying, it is rather harder and less rubbery in texture than our other specimens. The autozooids are very small and numerous, up to about 14 to a centimetre. The more typical number for this variety is about 8 to a centimetre, with about three small siphonozooids between two autozooids. In this specimen the siphonozooids are small and not numerous, generally in a single row, but sometimes up to 3 between two autozooids. We do not feel justified however in separating this into another species. The sterile stalk is short, wide and compressed, 2 cm. high with diameters of 6.5 and 1.7 cm. The compressed disc with a folded margin has diameters of 7.3 and 2.2 cm. The colour is a greyish brown.

7. *Sarcophytum convolutum* n. sp. (Plate XI, Fig. 7; Plate XXIII, Fig. 1).

Stat. 144. Damar-island. 45 M. Coral bottom and Lithothamnion. 1 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion; sand and coral. 1 Ex.
Stat. 273. Jedan-island. 1 Ex.

Two light brown specimens with a marked resemblance to *S. acutangulum*, but differing in spiculation and in the size and number of the autozooids and siphonozooids. The larger specimen stands 9 cm. in height; the capitulum has a maximum diameter of 7 cm.; the sterile stalk has a height of about 7 cm., and is strangely compressed, being only about 7 mm. in thickness. This is possibly due to some peculiar condition of growth, for instance between two rocks.

Very characteristic are the numerous folds of the margin, about a dozen main lobes or puckerings being distinguishable. The autozooids are prominent, few in number, and distant from one another, often by an interval of 5 mm. The siphonozooids are very numerous, very distinct, and very crowded. There may be ten in a straight line between two autozooids. It is difficult to draw a boundary line between the upper expansions of the stalk and the puckerings of the capitulum, but the zooids of both kinds are confined to the upper or capitular surface.

Rather striking, though probably unimportant, is the close longitudinal striation of the surface of the colony below the convoluted margin.

The spicules include:

(*a*) spindles of varied size with compound or with simple warts, sometimes with a tendency to zoning; 0.5 × 0.04 mm.; 0.29 × 0.05 mm.;
(*b*) slender spindles with relatively few prominences; 0.22 × 0.02 mm.; 0.34 × 0.02 mm.; and
(*c*) rough-ended pseudo-clubs, derivable from the spindle type, 0.06—0.2 mm. in length.

The specimens differ from *S. acutangulum* in the following points: (*a*) the autozooids of the new species are much larger and less numerous; (*b*) the siphonozooids are larger and more numerous; (*c*) the clubs of the new species are less numerous and their heads are less well-defined and less warty; (*d*) the outer surface of the colony beyond the disc is covered with a very close longitudinal striation, in part, of course, the expression of strong contraction.

The specimens show a marked resemblance to MARENZELLER's *Lobophytum crebriplicatum* (Zool. Jahrb. I, 1877, p. 362, 1 fig.); but they cannot be separated from the genus that includes *S. acutangulum*. Moreover our specimens differ from that described by MARENZELLER as regards the siphonozooids, which are very numerous, very distinct, and very crowded. As to spiculation, the new species diverges from MARENZELLER's description of his inasmuch as there are numerous

pseudo-clubs and numerous slender spindles with simple prominences. Superficially, however, there is a close resemblance, especially in the folding of the capitulum.

In the spicules of a specimen from Jedan Island there were included amongst the warted spindles some rather stouter pointed spindles (0.32 × 0.09 mm.).

A very small colony from Station 144, Damar, seems to us to be a young form of this species. The total height is 2.4 cm.; the stalk with an average diameter of 8 mm. shows a deep fold at one side which is continued into the capitulum. The remainder of the capitular margin is slightly lobate. The autozooids, about 2 mm. apart in the centre, but more crowded round the edge, are distinct, but it is difficult to distinguish the siphonozooids. The texture is gritty and the colour is a deep cream.

8. *Sarcophytum spongiosum* n. sp. (Plate XXI, Figs. 3 and 4).

Stat. 142. Laiwui, Obi Major. Reef. 2 Ex.

It has not been found possible to refer to any of the numerous described species two specimens from Station 142. They are marked by the following features:

(1) the disc does not extend far beyond the relatively broad stalk, a character that suggests reference to the *latum-ehrenbergi* group;

(2) the very small siphonozooids occur in more than one row (2—3) between the relatively large closely set autozooids;

(3) the stalk-spicules are shuttle-like spindles (up to 0.36 × 0.1 mm.) with somewhat distant zoned warts, the zones increasing with size from two to five, and the warts passing from simple cones to the blunt compound type. Although many small young forms occur, the general impression is of homogeneity. There are none of the typical very heavily warted *S. trocheliophorum* type, and none of the large long spindles of *S. glaucum*;

(4) along with the shuttles are small cortical clubs, with sparsely warted stalks, 0.13 mm. in average length;

(5) the capitulum includes numerous narrow elongated rods, sparsely warted and sometimes almost smooth (up to 0.4 mm. long and 0.03 mm. broad). Some are straight and others bent. There are also cortical clubs of diverse sizes.

The best specimen has a height of 7.3 cm., of which 7 cm. goes to the stalk. The maximum breadth of the stalk, which is rather flattened, is 2.8 cm. The diameters of the capitulum are 4 cm. and 2.7 cm. The texture is spongy, the colour grey-brown.

9. *Sarcophytum tenuispiculatum* n. sp. (Plate XXII, Fig. 6).

Stat. 64. Djampeah. Up to 32 M. 1 Ex.

We base this new species on its spiculation exclusively. A mushroom-like form with a pronouncedly thick stalk and a well defined slightly lobed capitulum. The stalk is 4.2 cm. in height, and expands above its attachment to a thickness of 3 cm. The diameters of the capitulum are 3.5 cm. and 4 cm. Over the surface there are numerous retracted autozooids, about 0.5 mm. in diameter, and minute siphonozooids, requiring a lens for their detection, fill up the interspaces. The surface is distinctly rough.

The distinctive feature is the large number of long very delicate spindles, with relatively

few simple low conical prominences, sometimes in zones, sometimes irregularly scattered. We have not seen these in any other species of Sarcophytum known to us or figured. The following measurements were taken: 0.48 mm. × 0.02 mm.; 0.42 mm. × 0.04 mm.; 0.25 mm. × 0.02 mm.

There are numerous more ordinary tapering spindles, with warts simple, or compound, zoned (often very markedly), or irregular. Almost all these spindles are relatively narrow. The following measurements were taken: 0.25 × 0.04 mm.

Numerous pseudo-clubs occur, some of them rather coarser than the spindles, from which they are derivable.

A few elegant crosses were seen.

The spicules of the stalk are mainly robust spindles, relatively broader than those in the capitulum, with simple or compound warts, usually zoned. The following measurements were taken: 0.32 mm. × 0.07 mm.; 0.22 mm. × 0.07 mm.; 0.08 mm. × 0.02 mm.

Genus **Lobophytum.**

1. *Lobophytum candelabrum* Roule.

For description see: L. ROULE, Alcyonaires d'Amboine, Rev. Suisse Zool., XVI, 1908, p. 177, 4 figs.

Stat. 58. Savu. Reef. 1 Ex.
Stat. 115. Kwandang Bay. Reef. 1 Ex.
Stat. 136. Ternate. 27 M. Mud and stone. 1 Ex.
Stat. 181. Amboina. 1 Ex.
Stat. 240. Banda. 9 to 45 M. Black sand. Coral. Lithothamnion bank in 18—36 M. 13 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion, sand and coral. 3 Ex.
Stat. 261. Elat, Kei-island. 27 M. Mud. 1 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 M. Sand, coral and Lithothamnion. 3 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 18—45 M. Mud, coral and Lithothamnion. 1 Ex.

To this species we refer several colonies with the following characteristics:

(*a*) there are numerous digitiform, elongated, terminally rounded lobes;

(*b*) the autozooids are relatively few and distant; the siphonozooids are crowded and very distinct;

(*c*) the spicules are of two types in varying proportions. (1) The great majority are substantial spindles, with zones of very compound warts, some elongated, others more compact. Yet the latter rarely approach the compact ovoids so characteristic of *L. crassum*. (2) There is a minority of rather smooth spindles with simple conical prominences.

Some of the younger, smaller colonies have the lobes considerably less developed in length, but all stages of growth are shown.

LÜTTSCHWAGER (Revision der Familie Alcyoniidae, 1915, p. 33) has incorporated this species with *L. pauciflorum* (Ehrb.), but we feel that the typical markedly elongated, digitiform lobes, the more distant autozooids, and the narrow elongated spindles found in *L. candelabrum* justify us in retaining the latter as a separate species.

Previously recorded from Amboina.

2. *Lobophytum crassum* Marenzeller.

For description see:
MARENZELLER, Über die Sarcophytum benannten Alcyoniiden, Zool. Jahrb. I, 1886, p. 363, 4 figs.

Stat. 37. Sailus Ketjil, Paternoster Islands. 10 M. Coral and coral sand. 5 Ex.
Stat. 58. Savu. Reef. 1 Ex.

Stat. 86. Dongala, Celebes. Reef. 1 Ex.
Stat. 115. Kwandang Bay. Reef. 2 Ex.
Stat. 127. Great-Sangir-Island. 45 M. Fine, dark-coloured, sand. 1 Ex.
Stat. 142. Laiwui, Obi Major. Reef. 1 Ex.
Stat. 152. Waigeu-island. Reef. 1 Ex.
Stat. 213. Saleyer. Reef. 2 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion, sand and coral. 1 Ex.
Stat. 279. Roma. Reef. 2 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M. Mud, coral and Lithothamnion. 1 Ex.
Stations. Unrecorded. 6 Ex.

A large colony from Station 37.

Characteristic of this species are the following features:

(1) the lobes are large, tough, and vary greatly in form from robust upstanding cylinders to flattened ingrowing lobes, every gradation being represented. Some of the colonies differ widely from the others in their growth-form, showing only a few large marginal foldings in a manner suggestive of Sarcophytum;

(2) the openings of both kinds of zooids are very distinct, even the siphonozooids being visible with the naked eye;

(3) the autozooids can never be called distant as in *L. hedleyi*, unless on the margins of the lobes.

The spicules include:

(*a*) compact ovals with two median zones and terminal clusters of very compound warts; 0.2 × 0.08 mm.;

(*b*) more elongated broad spindles of the same warty type, 0.24 × 0.1 mm.;

(*c*) slender spindles with as many as four zones of compound warts; and similar forms without zoning; 0.26 × 0.03 mm.;

(*d*) slender spindles with conical prominences not compound; some of these are very minute, and obviously young forms, 0.15 × 0.03 mm.;

(*e*) interesting almost smooth, short, broad, truncate forms with only incipient prominences in two zones; these are connected with the (*a*) type by transition forms, and are evidently half-finished spicules, 0.15 × 0.05 mm.;

(*f*) a few forms broader at one end and approximating to "clubs"; 0.15 × 0.02 mm.;

(*g*) a few crosses, average greatest diameter 0.1 mm.

It should be noted that different specimens vary greatly in the proportions of narrow spindles and compact ovals.

The large brown convoluted colony from Station 37 has a maximum height of 10 cm.; the irregular disc is about 23 cm. in length, by about 9 cm. in breadth.

A specimen from Station 213, Saleyer, has a curious flattened trunk region tapering off ventrally to a sharp edge and with no base of attachment. A similar type of sterile trunk like an inverted cone was seen in one of the specimens of *Sinularia flexibilis* (Q. G.). The specimen probably, we imagine, grew upright in a sandy bed. From the sterile trunk arise long and rather twisted lobes most of which branch into smaller lobes. Maximum diameters of the trunk are 5.8 cm. × 9 mm.; height of trunk 3 cm.; total height 6.2 cm.; longest undivided lobe 2.2 cm. × 6 mm. The lobes are flexible but brittle, and the whole surface is rather granular.

The autozooids are smaller and more numerous than in most of the specimens. The numerous siphonozooids are also rather smaller, but just visible to the naked eye. The colour is a creamy light brown. The spicules agree well with the typical *L. crassum* types. The great majority are the short stout barrel-like forms with two zones of compound warts and warted ends (0.15 × 0.08 mm.). The long pointed spindles covered with zones of warts were also present and less numerous pseudo-clubs.

Another interesting colony, from an unrecorded locality, of Sarcophytum-appearance, almost exactly like BURCHARDT's figure of *S. glaucum*, but agreeing in its spicules with *L. crassum*, which is a variable species. We do not think that the fungoid form of a relatively young colony has any significance. In this case a longitudinally grooved stalk (8 cm. in height) leads to a folded capitulum, with diameters of 7.5 and 4.5 cm. The autozooids are numerous, almost wholly retracted; the siphonozooids are very inconspicuous, only in some places to be detected (with difficulty) with the naked eye. The spiculation of the capitular region includes:

(*a*) broad multizoned spindles with compound warts;
(*b*) narrow multizoned spindles with compound warts;
(*c*) a few pseudo-clubs;
(*d*) some almost oval forms derived from (*a*);
(*e*) some narrow spindles with simple prominences, not very numerous;
(*f*) a few small narrow spindles with simple blunt prominences, exactly as MARENZELLER figures, apparently young forms of (*e*).

The stem shows predominantly broad ovals with two zones of compound warts, and other compound warts clustered at each end. There are also approximate double-spheres and spheres covered with compound warts.

A young colony, from Savu, standing 3.3 cm. in total height, in which the sterile trunk counts for 1.2 cm. The trunk is somewhat flattened at right angles to the longer axis of the colony, and has a maximum length of 5.6 cm., and a breadth of 1.2 cm. The disc shows about a dozen folds and lobes, rising vertically and somewhat flattened in the plane at right angles to the flattening of the trunk. The autozooids are numerous, and in some parts crowded; the numerous siphonozooids between them are just discernible with the unaided eye. The spicules include (*a*) large numbers of stout broad spindles and ovals with crowded zones of compound tubercles, five zones being common; (*b*) more elongated spindles with as many as six zones of less massive warts; (*c*) various young forms of both types with incipient warts; (*d*) small spindles with two zones of short warts; (*e*) a few pseudo-clubs.

This colony shows some points of resemblance, especially in its mode of growth and spicules, to WHITELEGGE's *L. hedleyi*; but it seems still closer to the variable *L. crassum*. Whatever view be taken as to the separateness of the species, *L. hedleyi* and *L. crassum* must be close together.

From the same locality a large spreading colony, with a maximum diameter of 8.8 cm. A sterile trunk of about 5 cm. in height leads to the massive disc covered with conical lobes, often about 1.7 cm. in length.

Previously recorded from Reunion, Port Denison, Andamans, Tonga.

3, *Lobophytum hedleyi* Whitelegge.

For description see: WHITELEGGE, Alcyonaria of Funafuti, Part I, Memoirs Australian Museum, 1897, III, pp. 216—17, 8 figs.

Stat. 115. Kwandang Bay. Reef. 7 Ex.
Stat. 250. Kur-island. Reef. 1 Ex.
Stat. . Unrecorded. 1 Ex.

Numerous dull brown specimens with many finger-like branches, rising from the disc-expansion of a substantial sterile trunk, 6 cm. in height and about 5 cm. in diameter. The disc has a maximum length of 8 cm. and a breadth of 6 cm. A common length for a digitiform branch is 2 cm. with a breadth of 5 mm. They are very crowded and thus they are sometimes compressed. The trunk shows marked longitudinal plications especially in the larger colonies.

In many cases the finger-like branches arise not directly from the disc but from a somewhat flabellate primary lobe.

The autozooids are relatively few and distant. The siphonozooids are crowded and visible to the unaided eye.

The spicules include the following forms:

(*a*) Most characteristic, the numerous, stout, subcylindrical forms, with four whorls of compound tubercles; some approach double spheres; 0.14 × 0.08 mm.;
(*b*) longer substantial spindles, with more zones of compound tubercles; 0.22 × 0.07 mm.;
(*c*) similar narrower sharp-pointed spindles; 0.28 × 0.05 mm.;
(*d*) numerous pseudo-clubs with compound tubercles; 0.12 × 0.05 mm.;
(*e*) small narrow spindles with two zones of short prominences; 0.11 × 0.02 mm.;
(*f*) a few crosses.

A small colony, about 5 cm. in height, shows an irregularly folded capitulum, with the beginnings of the digitate outgrowths which are marked in the larger forms. It should be noted that WHITELEGGE's specimen was a young form with little hint of digitation, and here we may record again our conviction that the mode of growth is very unimportant in young colonies.

The autozooids are sparse in most places, more marked at the tips of the lobes. The siphonozooids are crowded and distinctly visible to the unaided eye. Very characteristic is the abundance of acutely-pointed multi-zoned spindles and blunt multi-zoned forms of a more cylindrical type.

Among the distinctive features of *L. hedleyi* the following may be noted:

(*a*) the long drawn-out lobes of the larger specimens;
(*b*) the harsh texture of the sterile stalk as distinguished from the lobes;
(*c*) the long intervals between the autozooids, 2 mm. being common; and the large number (up to 10) of siphonozooids between;
(*d*) the numerous very compact warty double-spheres, as in WHITELEGGE's fig. 2*e*;
(*e*) the presence of small spindles, smooth except two zones, as shown in WHITELEGGE's fig. 2*g*.

Previously recorded from Funafuti.

4. *Lobophytum pauciflorum* Ehrb.

For descriptions see:

KLUNZINGER, Korallthiere des rothen Meeres, 1877, p. 29, 1 fig.
MARENZELLER, Zool. Jahrb. I, 1877, p. 366, 1 fig.
PRATT, Fauna and Flora of Maldives, II, 1903, p. 515, 4 figs.

Stat. 37. Sailus Ketjil, Paternoster-Islands. 27 M. and less. Coral and coral sand. 1 Ex.
Stat. 58. Savu. Reef. 1 Ex.

A large yellow brown colony, with a length of 17.5 cm., a breadth of 6 cm., and a height of 6.8 cm. The mode of growth is well shown in Miss PRATT's figure: a massive sterile portion leads to a lobed capitulum, the lobes being continued towards the centre with an upper contour somewhat cockscomb-like (as mentioned by MAY for *L. crassum*) and with deep valleys between. The autozooids are very distinct and there are as many as 9 to a centimetre, though in the centre they may be as much as 3 mm. apart. The siphonozooids are numerous and visible to the naked eye; three to six may occur between two autozooids. The predominant spicules are compact, somewhat cask-like, blunt-ended ovals with zones of compound warts, sometimes with a hint of a waist. Besides these there are warty spindles and small rough clubs, all as figured by MARENZELLER. A small specimen from Savu shows the same spicules.

We must note, however, that the separation of *L. pauciflorum* from the varieties of *L. crassum* is very difficult and far from satisfactory. We are basing our identification on the predominance of the cask-like spicules and the relative fewness of sparsely warted spindles.

Previously recorded from Andaman Islands, Tonga Island, Maldives, Red Sea, Ceylon, New Zealand, Moluccas, etc.

Genus **Anthomastus.**

1. *Anthomastus agaricus* Studer.

For description see: STUDER, Alcyonaires provenant des campagnes de l'Hirondelle, XX, 1901, p. 27, 3 figs.

Stat. 18. 7° 28′.2 S., 115° 24′.6 E. 1018 M. Fine grey mud. 5 Ex.

Five specimens of this species from Station 18 at 1018 fathoms agree perfectly with STUDER's description and figures. The largest has a height of 6.4 cm. From an expanded basal disc the flattened trunk portion, 5 × 2 mm. at the base, gradually widens till it terminates in the oval polyp-bearing disc which has a maximum diameter of 1.9 cm. The disc is covered in the centre with numerous small siphonozooids and bears round the margin 8 large autozooids. These are all expanded but in a shrivelled state of preservation. The most fully expanded has a length of 7 mm. and a breadth of 2.7 mm. The colour of the specimens is deep red shading into pink towards the base of the trunk.

In one of the smaller specimens, with a height of 3.4 cm., all the polyps are contracted within the disc which has diameters of 1.7 and 1.4 mm.

The spicules of the stem and disc include:

(*a*) small double stars, pinkish in colour; average dimensions are 0.08 × 0.05 mm.;

(*b*) short stout spindles generally with blunt ends and covered with very low simple prominences;

A common size is 0.12 × 0.04 mm. These are colourless or faintly pink.

(*c*) very slender straight or slightly curved spindles, smooth or with comparatively few very minute simple prominences. They are pink in colour. The measurements of the largest of these to be seen were 0.5 × 0.02 mm.

Previously recorded from Terra Nova, 1267 m.

Family Nephthyidae.

Genus **Lithophytum.**

1. *Lithophytum stuhlmanni* (May). (Plate XXIII, Fig. 9).

For description see: Kükenthal, Versuch einer Revision der Alcyonarien. II, Nephthyiden. 1. Theil, Zool. Jahrb. XIX, 1907, p. 116.

Stat. 213. Saleyer. Reef. 1 Ex.

A luxuriant, much branched, flaccid colony of a yellowish colour, with a total height of 17 cm. Numerous branches arise simultaneously from the top of a short basal portion which is about 1 cm. in height. The breadth of this stalk at the top from which the branches diverge is about 5 cm.

The features of the species are (1) the elongated narrow catkin-like lappets, which attain a length of 2 cm., (2) the absence of spicules from the polyps, (3) the numerous irregular micro-sclerites of which many are jagged interlocking rodlets with relatively long prominences. There are also a few spindles with long abruptly projecting prominences. There are numerous yellowish warty bodies, somewhat like double spheres, but they are certainly extrinsic sand-grains. The canal walls contain long warty spindles, often with a bend and a cross line across the middle. Intermediate between these large spindles and the micro-scleres there are straight or slightly curved spindles irregularly covered with low roughnesses. This specimen agrees well with May's description of *Lithophytum sanderi*, but Kükenthal's reinvestigation showed abundant spiculation of the polyps.

Previously recorded from the Indian Ocean.

2. *Lithophytum viridis* (May).

For description see: Kükenthal, Versuch einer Revision der Alcyonarien II. Nephthyiden, Zool. Jahrb. XIX, 1907, p. 115.

Stat. 142. Laiwui, Obi Major. Reef. 1 Ex.
Stat. 248. Tiur. Reef. 1 Ex.
Stat. 279. Roma-island. 36 M. Mud and sand. 1 Ex.

A yellowish brown colony, from Station 248, rising to a height of 9.5 cm., with a spread of 8.5 cm. A massive short stem gives off numerous branches, which rebranch and end in crowded conical lappets. These are entirely covered with polyps. There are no spicules in the polyps or on the cortex of the branches. The cortex of the stem shows numerous irregular jagged bodies, many of the capstan type, and including some which may be described as double stars, as in *L. stuhlmanni*. In the interior of the stem there are stout spindles covered

with low warts, some blunt, some simply conical, and others compound. Some of the coarsely warted spindle-types are branched. This species seems to us to be very near *L. stuhlmanni*, which has, however, (1) more elongated narrow lappets, and (2) spicules on the cortex of the branches.

Another specimen, from Station 142, of a creamy yellow colour, rises to a height of 6 cm. and has markedly tapering conical lappets covered with polyps. The superficial sclerites of the stem are mainly irregular jagged discs and double capstans.

Previously recorded from Indian Ocean, East Coast of Africa.

Genus **Capnella.**

1. *Capnella fungiformis* Kükenthal. (Plate X. Figs. 2 and 5).

For description see: KÜKENTHAL: Versuch einer Revision der Alcyonarien. II. Nephthyidae, Zool. Jahrb. XIX, 1904, p. 133, 4 figs.

Stat. 58. Savu. Up to 27 M. Sand. 5 Ex.
Stat. 60. Haingsisi. 23 M. 1 Ex.
Stat. 152. Wunoh-bay, Waigeu. 32 M. Lithothamnion-bottom. 1 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 M. Sand, coral and Lithothamnion. 1 Ex.
Stat. 301. Rotti. Reef. Mud, coral and Lithothamnion. 3 Ex.

Apart from the mode of growth our specimens agree well with KÜKENTHAL's species. But whereas his colony had a fungus-like appearance due to the close apposition of very short flat lobes, ours has a more elongated polyparium, with numerous short thick branches arising from a substantial trunk. We have figured two colonies, one nearest to, the other furthest from the type described by KÜKENTHAL, and intermediate modes of growth also occur.

More important, it seems to us, is the agreement in spiculation. There are three main types: — (*a*) clubs with large prominences, sometimes approaching foliate at the thick end; (*b*) substantial spindles with prominent warts; (*c*) numerous ovals and double-spheres showing compound warts often in zones. The sterile trunk is sometimes longitudinally striped. A cross section shows extremely numerous very narrow canals.

The largest specimen has a total height of 10.5 cm. of which 5 cm. consists of the unbranched trunk. This then branches and rebranches, the polyps borne on the terminal twigs.

Previously recorded from Dar es Salaam.

2. *Capnella imbricata* (Q. G.) (Plate X, Fig. 6; Plate XXIV, Fig. 2 and 5).

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, Nephthyidae, Part I, Zoolog. Jahrbücher XIX, 1904, p. 129.

Stat. 33. Bay of Pidjot, Lombok. 22 M. and less. Mud, coral and coral sand. 16 Ex.
Stat. 60. Haingsisi. 23 M. 1 Ex.
Stat. 79b. Kabala-dua. Reef. Coralsand. 1 Ex.
Stat. 89. Kaniungan Ketjil. Reef. 1 Ex.
Stat. 91. Muaras Reef. 1 Ex.
Stat. 99. 6° 7′.5 N., 120° 26′ E. 16—23 M. Lithothamnion bottom. 11 Ex.
Stat. 104. Sulu. 14 M. 3 Ex.
Stat. 123. Biaru Island. 36—27. M. Stone and Lithothamnion-bottom. 1 Ex.

Stat. 142. Laiwui. Reef. 2 Ex.
Stat. 144. North of Damar-island. 45 M. Coral bottom and Lithothamnion. 1 Ex.
Stat. 213. Zuid-island. Reef. 4 Ex.
Stat. 213. Saleyer. 1 Ex.
Stat. 248. Tiur-island. Till 54 M. 3 Ex.
Stat. 250. Kur-island. 20—45 M. Coral and Lithothamnion. 2 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 36 M. and 20 fathoms. Mud, coral and Lithothamnion. 1 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 18—45 fathoms. Mud, coral and Lithothamnion. 3 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 2 Ex.

A specimen of a greyish brown colour, consisting of a stiff stem 2.5 cm. in height, and three main branches with polyps densely disposed in somewhat conical lobes. A notable feature is the thick armature of the incurved 8-lobed polyps, which are covered with foliaceous clubs, (*a*) mostly short, 0.1 × 0.08 mm.; (*b*) sometimes elongated like axes, 0.15 × 0.06. mm. (*c*) Others remind one forcibly of small axis vertebrae. (*d*) Many are ribbed, foliaceous at one end, with two or three jagged processes at the other. (*e*) Very characteristic are the 4-rayed stars or crosses, mostly stout and heavily warted, which abound in the canal walls. Some also occur in the cortex of the base; 0.2 × 0.18 mm. (*f*) Connected by transitional shapes with (*e*) are large, compact, spheroidal forms, covered with a few compound knobs, and often showing hints of being quadriradiate.

Among the small modified capstan-like spicules it is possible to make out a developmental series. The smallest are not far removed from double clubs, with one end bearing two knobs with prominences and the other end showing the first hint of foliaceous expansion. Slightly larger are forms in which the spinose end is more complex and the smoother end more foliaceous. From these by gradual stages there is a progression towards somewhat Bebryce-like types with an expanded head to the outside and a slightly divaricate base with pointed prominences.

A further development is due to one of the original knobs apparently predominating over the other and forming a relatlvely long rough process to one side.

The four rayed types are not mentioned by Wright and Studer, but Kükenthal notes their presence.

We do not see how it is possible to separate *Capnella capitulifera* (Wright and Studer) from this species, which is the older.

A much contracted cream-white colony from Station 315 stands 3 cm. high, of which about half goes to the common stem. From the top of this there arise five short main branches, which, after about 1.2 cm., bear conical lobes about 0.8 cm. in height. These are densely covered with the characteristic Capnella polyps, very like those figured by Wright and Studer for *Paranephthya (= Capnella) capitulifera.* Compared with the other specimens above referred to, this one shows rather stronger spicules, especially those of the almost spherical type and the quadriradiates. It does not on that account seem justifiable to separate the specimen from the *C. imbricata* species.

The specimen from Station 60 is particularly robust in its growth, with a maximum length of 10 cm., and a breadth of 6.2 cm., and rising to a height of 5.2 cm. It is densely covered with tapering finger-like lobes, which may attain a length of 2.3 cm. and an average breadth of 8 mm., all densely covered with incurved polyps.

A specimen from Muaras Reef differs somewhat markedly from the others in its mode of growth, and yet it has precisely the same spiculation as is shown elsewhere. The colony rises to a height of 4.8 cm., of which 3.2 is made up of the sterile stalk, which has an average diameter of 1.8 cm. The polyparium has diameters of 4.6 cm. and 3.3 cm. It consists of about fourteen low rounded hillocks, markedly different from the usual lobes which are characteristically, though not universally, much narrower cones. A common diameter for a rounded hillock is 1.5 cm. A specimen from Station 99 is in its mode of growth somewhat intermediate between the typical forms and the colony from Muaras. Here again we learn that the mode of a colony's growth is in many cases of secondary importance.

A fragment from Haingsisi, is simply the base of a young colony. It shows characteristic spicules, notably (*c*) and (*e*) types.

Previously recorded from Pacific Ocean, New Ireland.

3. *Capnella morula* Thomson and Mackinnon.

For description see: THOMSON and MACKINNON, Alcyonarians of Percy Sladen Trust Expedition, Trans. Zool. Soc. XIII, 1909, p. 179, 1 fig.

Stat. 58. Savu. Up to 27 M. Sand. 1 Ex.

A colony of a creamy brown colour, consisting of a short, much corrugated, densely spiculose stem, from which arise four main very short branches, dividing again into numerous rounded lappets, densely covered with almost imbricated polyps. The whole rises to a height of 3.6 cm., the head with a maximum breadth of 3.1 cm.

As there is no supporting bundle, but a mass of large canal wall spicules, it must be placed in the *Capnella-Lemnalia-Scleronephthya* section of the Nephthyidae. The difficulty is that the typical foliaceous clubs are not present, though their place is taken by club-like derivatives of spindles, with one end much expanded and divaricate. The aboral armature of a polyp, which shows no hint of a supporting bundle, consists of a double row of spindles, in chevron or straight according to the state of contraction. The aboral surface shows a few spicules without regular arrangement.

Besides the warty spindles there are triradiates, almost cylindrical forms with asymmetrical prominences like fangs, and very irregular small forms, some slightly foliate.

Previously recorded from S. W. Indian Ocean.

Genus **Lemnalia.**

1. *Lemnalia rhabdota* Bourne.

For description see: BOURNE, On the genus Lemnalia, Trans. Linn. Soc. Zool. VII, 1900, p. 528, 3 figs.

Stat. 47a. Entrance Bay of Bima. Coral shore. 1 Ex.
Stat. 60. Haingsisi. Shore. 1 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 36 M. Mud, coral and Lithothamnion. 3 Ex.
Stat. . Unrecorded, 1 Ex.

The best of three specimens is a much broken colony from Station 299, 22 fms., of a yellowish white colour and brown tentacles. The subsessile anthocodiæ are crowded on the distal

portions of the branches. As regards mode of branching and spiculation, there is agreement with BOURNE's description. The large spindles and the small irregulars are distinctly rougher and more substantial than in *L. peristyla*, but the two species are undoubtedly near one another. Other two specimens are nearer to the *L. peristyla* type of spiculation; so in this respect we have probably to do with a variational or a modificational series. There is notable diversity in form of the small capstans, irregular capstans, and brackets.

The habitat of BOURNE's specimen was unknown.

2. *Lemnalia peristyla* Bourne. (Plate XII, Fig. 3; Plate XIV, Fig. 6).

For description see: BOURNE, On the genus Lemnalia, Trans. Linn. Soc. Zool. VII, 1900 p. 529, 3 figs.

Stat. 37. Sailus Ketjil, Paternoster-islands. 27 M. and less. Coral and coralsand. 1 Ex.
Stat. 43. Sarassa. Up to 36 M. Coral. 1 Ex.
Stat. 213. Saleyer. Reef. 2 Ex.
Stat. 299. 10° 52'.4 S., 123° 1'.1 E. 34 M. Mud, coral and Lithothamnion. 1 Ex.

A somewhat translucent white colony from Station 299, with faint brown in the polyps, rising to a total height of 4.5 cm. From a stem, tapering slightly towards the base, three primary branches are given off, which pursue a vertical course for some distance before dividing into numerous elongated finger-like branches which may again divide. The anthocodiae are sessile and practically cover the surface. Among the larger spicules are (1) elongated fusiform types — straight and curved — with scattered low warts, (2) bracket-like and bow-like forms with prominent warts projecting outwards from the middle of the convexity.

Very characteristic are the approximately 4-rayed minute spicules, more delicate and smoother than those of *L. rhabdota*. A fine colony from Station 37, Sailus Ketjil, has a height of 5.1 cm. and a maximum spread of 4.9 cm. From a short common stock four main stems arise which again branch and rebranch into the finger-like branches. These vary in length from the shortest of twigs to elongated lappets, 8 × 1.5 mm., thickly covered with the sessile anthocodiae.

Previously recorded from the Philippines.

3. *Lemnalia nitida* (Verrill).

For description see: BOURNE, Trans. Linn. Soc. London, Zoology, VII, 1900, p. 529, 7 figs.

Stat. 99. 6° 7'.5 N., 120° 26' E. 16—23 M. Lithothamnion-bottom. 1 Ex.
Stat. 123. North-bay, Biaru-island. 36—27 M. Stone and Lithothamnion. 1 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 2 Ex.

The best specimen, rather broken, is a whitish colony, standing about 4.5 cm. The long spindles bear numerous fine warts, and the whole spiculation is more delicate than that of *L. terminalis*. Both species differ markedly from *L. lævis* n. sp. inasmuch as the larger spicules of the latter are perfectly smooth. Yet we should be inclined to place *L. terminalis*, *L. nitida*, and *L. lævis* in an evolution series, showing increasing smoothness in the large spicules.

Previously recorded from Zanzibar.

4. *Lemnalia cervicornis* (May). (Plate XIV, Fig. 9).

For description see:

MAY, Jenaische Zeitschr. Naturwiss. XXXIII (1899), p. 137, 1 fig.
KÜKENTHAL, Versuch einer Revision der Alcyonarien. II Nephthyiden, Zool. Jahrb. XIX, (1904), p. 138.

Stat. 213. Saleyer. Up to 36 M. 2 Ex.
Stat. 322. South coast of Bawean-Island. 32 M. Coral. 1 Ex.

The best specimen, whitish in colour, rises stiffly to a height of 2.8 cm. A sterile stalk, 8 mm. in maximum breadth, divides at the top into about a dozen somewhat antler-like branches, very much as in MAY's figure. The anthocodiæ are sessile. Most of the spicules are spindles, some with very low prominences, others more spinose, others with warts in zones. Two or three minute irregular sclerites were seen, which might be called 4-rayed, but appear to us more like young compact spindles with a pair of warts at each end.

Previously recorded from Mozambique, Zanzibar, East Coast of Africa.

5. *Lemnalia terminalis* (Quoy and Gaimard).

For description see: BOURNE, The genus Lemnalia, Trans. Linn. Soc. Zool. vol. VII, p. 530, 3 figs.

Stat. 129. Anchorage off Karkaralong-group. 23—31 M. 1 Ex.
Stat. 213. Saleyer. Up to 36 M. Coral reefs, mud and mud with sand. 2 Ex.
Stat. 252. Taam-island. 9—36 M. 3 Ex.

The finest specimen, from Station 252, stands 23.5 cm. high, a beautiful glistening white colony. It bears a strong superficial resemblance to *L. lævis* n. sp., but has notably different spiculation. It is markedly brittle.

A yellowish white specimen with shortly pedicelled anthocodiae on very slender branchlets. The tentacles are brownish. The spicules are more substantial than those of *L. nitida*, but the two types are the same, namely spindles and rayed forms. Irregular sculptured scales are present on the tentacles.

The broken stem of the specimen from Station 129 rises to a height of 6 cm., and a terminal branch is only 1.5 mm. in breadth.

This species seems to us to be closely related to *L. nitida*, but its terminal branchlets are more slender and its large spindles are much broader. We may notice that the forms which are called by KÜKENTHAL double stars with two long arms, which occur in both species, are more readily derived from a bow type shortened and with the median prominences exaggerated. Between the short quasi "double-stars" and the bows there are intermediate small brackets.

Three fragments of the tips of a branch from Station 129, the largest 9 mm. long, probably belong to this species of Lemnalia. The polyps are markedly pedicellate. On the transparent walls of polyps and stem are clearly seen large numbers of irregularly disposed very fine spindles.

Of two colonies from Station 213, Saleyer, the larger stands 6 cm. high and shows 4 main stems arising from a basal stock, each stem dividing soon into two closely parallel slender rounded branches, which again divide and then bear the elongated lappets. The colour is a deep cream and the whole colony is very brittle.

Previously recorded from Port Molle, Queensland; King George's Sound.

6. *Lemnalia brassica* (May).

For description see:
MAY, Jenaische Zeitschr. Naturwiss. XXXIII, 1899, p. 139, 2 figs.
KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, Nephthyiden, Teil I, 1904, p. 120.
——, Alcyonaria des Roten Meeres, 1913, p. 15.

Stat. 58. Savu. Up to 27 M. 1 Ex.

A specimen from Savu seems referable to the above species. The cauliflower-like colony has a maximum height of 2.2 cm. and breadth of 3.3 cm. with a basal diameter of 3 cm. The stem early divides into numerous upright rigid branches on the top of which are borne the thickly clustered polyps in flattened clumps. The polyps have dimensions agreeing more nearly with those described by MAY as *Ammothea bauiana* (= *Lemnalia*), which has been merged by KÜKENTHAL into the same species. Occasionally a more pointed lappet is seen, but for the most part these are very low and flat, about 2—3 mm. high.

The spicules include (*a*) small spindles from the polyps with a few simple warts towards the middle; average length 0.13 mm., breadth 0.015 mm.; (*b*) long pointed spindles with sharp simple prominences; dimensions up to 0.37 mm. long and 0.02 mm. broad; (*c*) a few bow forms with two exaggerated basal warts projecting, so that many show the typical Lemnalia quadriradiate shape; average distance from point to point of the bow, 0.12 mm. Young forms of this type are seen with the points so short that a capstan-like appearance results.

The colour is a deep cream, and the whole colony is hard and rigid, with a firm harsh texture.

Previously recorded from Indian Ocean, Baui Island (near Zanzibar).

7. *Lemnalia thyrsoides* (Ehrb.). (Plate IX, Fig. 2 and 6).

For description see:
KLUNZINGER, Korallentiere des rothen Meeres, 1877, p. 31, 1 fig.
REINHART, Jenaische Zeitschr. Naturw., 1907, XLII, p. 348.

Stat. 142. Laiwui, Obi. Reef. 23 M. Mud. 1 Ex.
Stat. 149. Fau anchorage and lagoon. W. coast of Gebé-island. 31 M. Coral. 1 Ex.
Stat. 258. Tual, Kei-island. 22 M. Lithothamnion, sand and coral. 1 Ex.

A vigorous colony, from Station 149, has a pronounced pinkish brown colour. A short stout base gives origin at a low level to several short branches, which soon divide into long polyp-bearing branchlets. The anthocodiae are prominent, but sub-sessile. The spicules are all spindles. The longer forms have relatively few low prominences, but there are shorter types distinctly rough. Somewhat rod-like minute scales, sculptured on the surface, are to be seen on the tentacles.

A strong colony from Station 142 has a creamy yellow colour and numerous finger-like polyp-bearing branchlets. These unite in twos or threes into short thick branches, springing from the common base. In this specimen the minute spindles with two or three zones of warts were unusually numerous, but there is the characteristic abundance of very delicate, elongated, relatively smooth spindles.

This common species, well described by KLUNZINGER and REINHART, is referred by KÜKENTHAL to his new genus Paralemnalia (Alcyonaria des roten Meeres, 1913, p. 16), but we are uncon-

vinced as to the validity of his distinctions between Lemnalia and Paralemnalia. Thus the degree to which the polyps are retractile varies greatly in one colony, as REINHART emphasises. Some of our specimens show prominent tentacles and anthocodiae; in others the retracted polyps are flush with the general surface.

A brownish specimen from Station 258 consists of 8 finger-like, flexible yellowish lobes evidently torn off a sterile trunk; the anthocodiae are practically sessile and scattered, more crowded towards the tips of the fingers. A common length for a finger is 2.2 cm., with a breadth of 4 mm.

The spicules include:

(*a*) narrow elongated spindles, smooth or with few warts; 0.35 × 0.02 mm. These form the great majority;

(*b*) smaller spindles with two or more whorls of warts, and warty ends; 0.05 × 0.01 mm.; occasionally arcuate;

(*c*) rather long whorled warty spindles with smooth ends (0.12 × 0.01 mm.);

(*d*) minute, probably young, compact spindles with two zones of small warts. These are not noted by BOURNE.

Previous Station not recorded.

8. *Lemnalia lævis* n. sp. (Plate XIV, Figs. 7 and 8).

Stat. 89. Kaniungan Ketjil. Reef. 1 Ex.
Stat. 104. Sulu. 14 M. Sand. 1 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 2 Ex. and fragments.

The best specimen from Station 315 is a vigorous cream-white colony, standing 13.5 cm. in height. A short stout basal portion almost immediately divides into four main branches, each of which gives off stout secondary branches rising in the main parallel to one another. These branch and rebranch, finally giving origin to slender polyp-bearing twigs.

The polyps are on short stalks, and are not very close to one another except at the ends of the twigs. Somewhat striking is the smallness of the polyp-bearing area as compared with the sterile trunk and branches.

The most distinctive feature, however, is in the spiculation, for the great majority of the spicules are delicate perfectly smooth spindles and rodlets, often with frayed ends. Dimensions up to 0.52 × 0.02 mm. In their absolute smoothness these larger spicules recall those of sponges. There are also, varying in frequency in different specimens, small arcuate forms which bear numerous conical prominences, usually stronger on one side. Dimensions up to 0.17 × 0.02 mm. From some of the asymmetrical bows a few three-rayed smooth types may be derived. Minute sculptured scales occur on the tentacles.

9. *Lemnalia squamifera* n. sp. (Plate XV, Fig. 10; Plate XXVII, Fig. 8).

Stat. 248. Tiur. Till 54 M.

A rigid white colony and fragment from Station 248 require the establishment of a new species of Lemnalia. In the form of growth they approach most nearly to *L. bauiana* (May) which species has been merged by KÜKENTHAL with *L. brassica* (May), (Versuch Revision etc.

Nephthyiden, 1904, p. 120; and Alcyonaria des Roten Meeres, 1913, p. 15), but the spiculation shows very different and characteristic features. The total height of the colony is 4 cm. with a maximum basal diameter of 2.7 cm. and a spread of 2.4 × 4.5 cm.

The rigid stem early divides (at a height of about 9 mm.) into numerous stout more or less upright branches which may again divide. At the summit are found the polyp-bearing lappets which are densely crowded, but more elongated and less cauliflower-like than the flattened lappets of *L. brassica*, being up to 1 cm. high and 4 mm. broad. The polyps are very small and closely set, up to 6 or 7 in a line of 5 mm. They are about 0.35 mm. in breadth and project almost at right angles, up to about 0.4 mm. beyond the level of the lappet.

The spicules include (*a*) numerous smooth sharply pointed spindles with few warts, up to 0.4 mm. long and 0.2 mm. broad; (*b*) a few small more warty crescents; and (*c*) crescents with two large basal warts approaching a quadriradiate, with an average maximum breadth of 0.09 mm.; (*d*) numerous and most characteristic small sculptured scale-like forms, often with two median zones of flat simple prominences, but many with more numerous and irregularly arranged warts. Dimensions, up to 0.11 mm. in length and 0.015 mm. in breadth. These are found in the tentacles and also in the rind of the lappets. (*e*) Interesting small forms intermediate between a normal spindle and a scale type. In some of these the spicule has the scale-like (*d*) dimensions, but the whole spicule is more rod-like and rounded, with the dark sculpturing confined to the warty zones and tips. In others, one half of the small spicule is spindle-like, rounded and unsculptured, while the other half is flattened, sculptured and scale-like.

Sculptured scales are, of course, very frequent in the tentacles of Lemnalia species, but we have never before seen them in such profusion and lying densely in the actual rind of the lappet.

Genus **Umbellulifera** n. g.

There are in the collection a number of specimens belonging to the Family Nephthyidae, which we cannot include in any described genus of that Family. In some respects they approach Eunephthya, while in others they seem to point to Dendronephthya. We have been compelled to establish a new and annectent genus, Umbellulifera, which helps to bridge the gap between these two genera. In this new genus we would include *Paraspongodes striata* Thomson and Henderson, which has been the subject of much uncertainty ever since it was described. As we agree with KÜKENTHAL's suggestion that *Paraspongodes striata* is "almost certainly identical" with his *Dendronephthya umbellulifera*, KÜKENTHAL's species must also be referred to our new genus, under the specific name *striata*, since the description of *Paraspongodes striata* has the priority. The new genus should include also *Lithophytum graeffei* Kükenthal and a new species *Umbellulifera petasites* here described.

All the specimens differ from Dendronephthya in:

(1) the general softness of the whole colony and much greater degree of contractility;
(2) the mode of branching, with cauliflower-like umbellate branches in the sharply defined polyparium;
(3) the fact that although the polyps are grouped in umbels at the ends of the twigs, they are never arranged in bundles within these umbels;
(4) the complete absence of anything approaching a definite supporting bundle;

From Eunephthya they differ as follows:

(1) there are no horizontal spicules in the polyp stalk, and there is no trace of a crown;

(2) there is a stronger development of the spicules along the dorso-median line of the polyp stalk. But this, does not merit the title "Stützbündel" as defined by KÜKENTHAL, which implies some measure of distinct differentiation and projection.

Thus although the new genus differs essentially from both Eunephthya and Dendronephthya, it has some of the characteristics of each.

As diagnostic of the proposed new genus, which seems to us to link these two genera, or at anyrate the two sub-groups typified by these two genera, we emphasise the following:

(1) the polyps arise singly, not in bundles in the Dendronephthya sense, and are crowded into rounded umbels;

(2) there is no definite supporting bundle. What is present is at most a stronger development of the spicules along the dorso-median line of the polyp stalk, not attaining anything approaching a projecting point;

(3) the anthocodial armature is more of the Dendronephthya type. It consists of en chevron points without even a pseudo-crown. The points on the outer convex surface are the strongest. They become weaker towards the inner concave surface, and in many cases the two inner points are rudimentary or entirely absent.

Within the genus thus established, we recognise the following species:

(1) *Umbellulifera striata* (Thomson and Henderson).
Syn. *Paraspongodes striata* Thomson and Henderson.
„ *Dendronephthya umbellulifera* Kükenthal.

(2) *Umbellulifera graeffei* (Kükenthal).
Syn. *Ammothea graeffei* Kükenthal.
„ *Lithophytum graeffei* Kükenthal.

(3) *Umbellulifera petasites* n. sp.

These three species show a distinct gradation in development, e. g. in the strengthening of the spicules on the dorso median line of the polyp stalk.

It is noteworthy that there are no spicules in the stalk or branches of *U. graeffei*, but in the two other species the spicules of these regions are of the same general type.

Here we wish to suggest that BURCHARDT's *Spongodes planoregularis* (Jenaische Denkschrift, vol. VIII, (1894—1903): SEMON's Forschungsreise, vol. V, 1898, pp. 439—440, 6 figs.), may well belong to this Umbellulifera genus. Indeed KÜKENTHAL suggested, in his Revision der Nephthyiden, Zool. Jahrb. XXI, 1905, p. 630, that his *Dendronephthya umbellulifera* came nearest to BURCHARDT's *D. planoregularis*.

The affinity between BURCHARDT's species and our series is indicated by the following features:

(*a*) the photograph of the colony shows the same peculiar branching, and the arrangement of the polyps in spheroidal umbel-like groups;

(*b*) the surface of the upper cortex shows the same cross striation as in our *Umbellulifera striata*;

(*c*) "the supporting bundle is weakly developed and does not project".

1. *Umbellulifera striata* (Thomson and Henderson).

Synonyms: *Paraspongodes striata* Thomson and Henderson.
Dendronephthya umbellulifera Kükenthal.

For description see:

KÜKENTHAL, Zool. Jahrb. XXI, 1905, p. 629, pl. 29, fig. 31; and Wiss. Ergebn. deutsch. Tiefsee-Exped., 1906, XIII, p. 82.

THOMSON and HENDERSON, Ceylon Pearl Oyster Report, 1905, p. 277, pl. 2, figs. 2 and 7.

Stat. 79. 2°43′ S., 117°44′ E. 41—54 M. Fine coralsand. 1 Ex.
Stat. 164. 1°42′.5 S., 130′47′.5 E. 32 M. Sand, small stones and shells. 4 Ex.
Stat. 213. Saleyer. 18—45 M. 1 Ex.
Stat. 240. Banda-anchorage. 9—45 M. Black sand. Coral. Lithothamnion-bank in 18—36 M. 1 Ex.
Stat. 282. 8°25′.2 S., 127°18′.4 E. 27—54 M. Sand, coral and Lithothamnion. 2 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 1 Ex.

This species was originally described by THOMSON and HENDERSON under the name *Paraspongodes striata* for "A specimen without Stützbündel". KÜKENTHAL suggested that in all probability it was a Dendronephthya and called it *Dendronephthya umbellulifera*. THOMSON and MACKINNON, in describing the Alcyonaria collected on the Percy Sladen Trust Expedition, accepted KÜKENTHAL's suggestion that the "Stützbündel" justified its inclusion in the genus *Dendronephthya*, but said "Three specimens of a greyish brown and yellowish brown colour are referable to this somewhat deceptive species (*umbellulifera*) of Dendronephthya, which shows very little 'Stützbündel'. The 'Stützbündel' is very inconspicuous and poorly developed and seemed at first sight absent. This deceptive appearance led to a previous reference of similar forms to the genus Paraspongodes".

An examination of a large number of specimens which undoubtedly belong to this species has convinced us that the tendency to strengthening of the polyp stalk is not within the definition of "supporting bundle". For this reason and the others cited above, we feel justified in establishing a new genus.

This species is marked by (*a*) the small close-set umbels which are grouped into larger umbels; (*b*) the transverse striation of the branches; (*c*) the absence or paucity of spicules in the canal walls; (*d*) the abundant presence of small spicules in the glistening cortex and (*e*) the character of these spicules. In general form these spicules agree closely with those of *U. petasites* n. sp., and include irregular capstans, minute simple capstans and rough double spheres.

The spindles of the polyp stalk show a more or less distinct longitudinal grouping, but not definite enough to justify the title "supporting bundle".

The anthocodial armature consists of 8—10 more or less definite double rows, those on the dorso-median line being the strongest. They diminish in number and strength towards the ventral surface, where two of the eight sets may be entirely absent.

In the collection there are numerous colonies all showing the same type of vegetative growth.

One specimen from Station 79 resembles that figured in the Ceylon Report. It has a total height of 14 cm. The sterile stalk is 5.5 cms. in length. It divides into two main branches, which rise for about 6 cms. before they re-divide and bear the umbels. The colour is greyish yellow.

There are several specimens from Station 164. The most remarkable of these is a tall colony with a sterile stalk 10 cm. long. At the top it bifurcates. One of the branches is barren,

in other words it does not bear polyps. The other again bifurcates and each of these gives rise to two branches. The two branches from one are barren, while those from the other are polyp-bearing. It is difficult to account for these sterile ends.

In another small specimen, without any basal attachment, there are two barren ends one of which may have been attached to a larger colony. Another colony with a sterile stem 3.5 cm. long is normal and typical. One specimen from Station 282 has no sterile stem, but is simply a complete polyparium or part of the polyparium of a larger colony. Another specimen from the same station is similar. It is very hard and black in colour, due no doubt to desiccation. The white spicules stand out very distinctly and are visible to the naked eye. Another colony similar to the last was dredged at Saleyer, 18—45 M.

From Station 315 comes a remarkable colony. The sterile stalk is 4 cm. long. The mode of branching is dichotomous and the polyparium is typical. There is no hint of attachment, but from the periphery of the base of the stalk there arise six or more stolons about 5 cm. long. Several of these are branched. All have sand and shells adhering to them and the colony was evidently anchored by them on a sand and shell bottom.

Previously recorded from Gulf of Manaar, Ceylon; Zanzibar; S. China Sea; Seychelles, 34 fathoms and Amirante 33.34 fathoms.

2. *Umbellulifera graeffei* (Kükenthal). (Plate IX, Fig. 4).

Synonyms: *Ammothea graeffei* Kükenthal.
Lithophytum graeffei Kükenthal.

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, Nephthyiden, Zool. Jahrbücher XIX, 1904, p. 113, 2 figs.

Stat. 294. 10° 12'.2 S., 124° 27'.3 E. 73 M. Soft mud with very fine sand. 1 Ex.

We also refer to this new genus a large and striking colony from Station 294, which agrees entirely with KÜKENTHAL's description of *Lithophytum graeffei.*

In our specimen, which has a rather cauliflower-like appearance, a soft flaccid stem, 6 cm. × 1.5 cm., after spreading out domewise to a diameter of about 5.5 cm., gives rise to a great many short, broad and somewhat flattened stems (about 2 cm. long and 1.7 cm. in maximum diameter) which divide and re-divide into a number of branches and twigs. The polyps are borne on the small terminal twigs in flat umbels about 4 mm. across; but as a great many terminal twigs arise close together, the closely adjacent umbels form larger umbels which again form one large umbel or cauliflower-like polyparium, 12 cm. in diameter and 6 cm. in height.

The polyps are about 2 mm. high and 0.9 mm. broad. The spiculation of the polyp stalk varies very markedly in different parts of the colony, and also on adjacent polyps. In some there is only a single longitudinal spindle; in others two, three, four or even five are clustered together — a distinct strengthening of the polyp stalk. The anthocodial armature consists of, in the majority of cases, 8 en chevron pairs of delicate, straight or slightly bent, spindles, covered with small simple warts.

There are no spicules in the stem or branches, either in the cortex or the canal walls. The colour in spirit of the stem and branches is a yellowish cream with creamy white polyps.

Previously recorded from the Indian Ocean and the China Sea.

3. *Umbellulifera petasites* n. sp. (Plate I, Fig. 4; Plate XXI, Fig. 11).

Stat. 19. 8°44′.5 S., 116°2′.5 E. 18—27 M. River-mud, coral, coral sand. 1 Ex.
Stat. 79. 2°43′ S., 117°44′ E. 41—54 M. Fine coral sand. 1 Ex.

We refer to this species two specimens, one from Station 79 and one from Station 19 (Labuan Tring, Lombok). The first has a sterile stalk, 21 cm. in length, a basal diameter of 2.5 cm. and an average diameter of 1.3 cm. At the top of stalk there arise, almost at the same level, five main branches. These immediately ramify and the ends of the small twigs bear the umbels. The polyparium is 6 cm. in width and 3 cm. in height. It is compact and cauliflower-like. The colour of the coenenchyma of the stalk and branches is white, but the spicules of the polyps are reddish; and this gives the polyparium a decidedly pinkish appearance.

The spiculation of the polyp stalk is sparse, but on the outer surface there sometimes occur two or even 3 longer red spicules, a distinct hint of strengthening.

The spicules of the anthocodiae are arranged in eight en chevron rows. In each row the number varies from 5—8 pairs, but 6 is most frequent. These narrowing chevron rows become almost parallel towards the tentacles.

The lower portion of the sterile stalk is densely spiculose, but this spiculation diminishes upwards, so that at the top and in the branches, spicules are practically absent. There are a few warty spindles in the canal walls. These attain a length and breadth of 2.6 mm. and 0.25 mm.

The spicules of the outer cortex of the sterile stalk include the following characteristic forms:

(*a*) irregular capstans with each end extended into four or so compound bosses, the middle part of the capstan being more or less bare; minute simple capstans are probably the young stages of the large irregular forms;

(*b*) very rough irregular forms having compound knobs all over, thus approximating to very rough double spheres.

In another specimen from Labuan, the long sterile stalk extends for 16 cm., and bears a dense polyparium 2.1 cm. in height with a diameter of 3 cm. As regards anthocodial armature and the spicules of the sterile stalk this specimen agrees with the others.

Genus **Nephthya.**

1. *Nephthya albida* (Holm).

For description see:
Kükenthal, Versuch einer Revision der Alcyonarien, II Nephthyiden (I), Zool. Jahrb. XIX, 1904, p. 160.
Holm, Beitr. zur Kenntniss der Alcyonidengattung Spongodes. Zool. Jahrb. V, 1895, p. 30, 3 figs.

Stat. 213. Saleyer. Up to 36 M. Coral reefs, mud and mud with sand. 1 Ex.

A bushy white colony, 8 cm. high, with a basal spread of 5.7 cm. and a maximum spread of 11 cm.

If Kükenthal's scheme be followed it should be ranked near *N. albida*, for it has conical lappets, terminally rounded; the polyp-spicules are smaller internally and consist of smooth rodlets.

It agrees with *N. albida* in the following features:

(*a*) an ensheathing supporting bundle does not project;

(*b*) the dorsal and lateral surfaces of the polyps show double rows of towards 6 pairs of spindles in chevron;

(*c*) the larger cortical spicules include not only thorny spindles but some thorny pseudo-clubs and numerous jagged irregular forms;

(*d*) Some of the canal-wall spindles are almost smooth.

Previously recorded from Red Sea.

2. *Nephthya amentacea* Studer.

For description see: STUDER, Mitth. Geogr. Ges. Naturh. Mus. Lübeck. II, Part 7 and 8, p. 123, 2 figs.

Stat. 60. Haingsisi, Samau-island. Reef. 1 Ex.

An upright bushy colony from Haingsisi approaches most nearly to this species. The stem is broad and short, dividing after about 1 cm. into numerous stout lappet-bearing branches. The conical lappets have average dimensions of 8 mm. × 4 mm. The polyps are borne at a slightly acute angle to the polyp stalk; the supporting bundle is strong with spindles up to about 1 mm. long, seldom projecting beyond the polyp head. The armature of the polyp shows up to 5 or 6 pairs of spindles in chevron on the back and sides of the polyp, and on the inner side there are a few more irregularly arranged rather smaller spindles.

The spicules of the upper rind are stout warty spindles up to 1.1 mm., often with the thorns somewhat larger to one side; these are shorter and more thorny in the lower rind, where there are also found a few smaller forms, rather irregular with large projections. These are not at all numerous, the great majority being the spindle type. In the canal walls are found finely warted spindles up to 1 mm. in length.

Previously recorded from Sulu-Island.

3. *Nephthya chabrolii* Audouin.

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, 1904, p. 157.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion, sand and coral. 5 Ex.
Stat. 273. Jedan-island. 13 M. Sand and shells. 2 Ex.
Stat. Unrecorded. 2 Ex.

Several well-developed limp colonies, with a considerable range of colour variation, show the characters of this species. Thus the growth is bushy, the short stem early dividing into several branches; the polyps arise in small clump-like lappets on the surface of the stem and branches, or are borne on the terminal oval-conical twigs or lappets. In a fully expanded colony the growth approaches more nearly to the Dendronephthya type than in most species of Nephthya. The polyps are 0.5—0.6 mm. high and 0.5—0.7 mm. broad. They sit at right angles to the polyp-stalk. The armature consists dorsally and laterally of 5—8 pairs of spicules in chevron and on the inside of 4 pairs. The supporting bundle consists of thorny spindles, which do not generally project. In the upper cortex lie thorny spindles; in the lower cortex are found spindles and numerous stars, and double stars. In the canal walls are long spindles, up to 1.3 mm., covered with simple prominences.

Four limp flattened colonies, from Station 258 and an unrecorded locality, all show the same colouring — the stem and branches a grey-cream colour and the polyps an orange yellow. Under a lens the polyp is seen to be sulphur yellow, while the spicules of the supporting bundle are yellow tinged with red, thus giving a more orange colour to the whole. The largest of these colonies has a height of 11 cm. and a spread of 6.5 cm., and the walls of stem, branches and twigs are all collapsed.

Two colonies from Station 273 have an orange-coloured stem fading to pale yellow on the twigs, and orange-coloured polyps. The spicules of the supporting bundle are again yellow tinged with red. The taller very well preserved specimen, 12 cm. in height with a spread of 7 cm., has a membranous base spreading over stone, and this basal membrane is colourless, the orange colour only beginning with the actual stem. The two specimens are at first glance very dissimilar in mode of growth, as one is fully expanded, with the walls of the twigs not collapsed, (as was the case in the specimens from Stat. 258), while the other specimen is very fully contracted, with the cortex of the branches and twigs showing transverse wrinkles, while the polyps have become more densely crowded on the lappets.

Several other colonies, from Stat. 258 and Stat. 164, and an unrecorded locality, show grey-cream coloured stems, frequently tinged with pink towards the tips of the branches and twigs. This is due to red spicules in the cortex, while the polyp is white with colourless anthocodial spicules and with a red supporting bundle. One colony from Stat. 258 is intermediate between the orange and the red types, with orange anthocodial spicules and a red supporting bundle. The pinkish forms show exactly the same armature of the polyps and general spiculation of the stem, branches, and canal walls as in the orange colonies.

Previously recorded from Red Sea, Pacific Ocean (Java-Sea, Celebes, Ternate, New Guinea, Chinese Sea).

4. *Nephthya columnaris* Studer.

For description see: STUDER, Mitth. geogr. Ges. u. naturh. Mus. Lübeck (2) Heft 7 and 8, p. 125, 2 figs.

Stat. Unrecorded.

A limp, cream-coloured, very expanded colony, with a total height of 14 cm. and a spread of 7 cm., can be referred to this species. The sterile stem divides at a height of 2.7 cm. into several long branches which give rise to twigs bearing the polyp-covered lappets or directly to the lappets themselves. The lappets are conical with rounded tips. The polyps are borne at almost right angles to the supporting bundle; this consists of warty spindles, one or sometimes two of which may project slightly. The polyp armature consists of about 5 pairs of spindles indefinitely arranged in chevron rows, and very much weaker and more irregularly disposed ventrally. The spicules of the upper rind are slender thorny spindles. In the basal rind there are coarser spindles with the thorns frequently more strongly developed on one side. These types pass into jagged irregular thorny forms. In the canal walls lie massive finely thorned spindles up to 1.2 mm. in length.

Previously recorded from Pacific Ocean (Dongala, Celebes).

5. *Nephthya cupressiformis* Kükenthal.

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien. II. Nephthyiden. Zool. Jahrbücher, XIX, 1904, p. 153, 2 figs.

Stat. 37. Sailus Ketjil, Paternoster-islands. 27 M. and less. Coral and coral sand. 1 Ex.
Stat. 213. Saleyer. Up to 36 M. Coral reefs, mud and mud with sand. 1 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M. Mud, coral and Lithothamnion. 1 Ex.

A colony from Station 299, of a grey-brown colour, with a height of 8.2 cm. of which 2.8 cm. forms the sterile stem. The colony is limp, with pointed elongated conical lappets, and the whole is suggestive of a spread-out cypress. It may be referred to *Nephthya cupressiformis* for the following reasons:

(1) the conical pointed lappets;
(2) the abundance of other spicule-forms besides spindles and cylinders;
(3) the very strong thorns of the spindles, which are often unsymmetrically disposed and on the basal cortex may approach the foliaceous;
(4) the abundance in the lower cortex of compact very jagged irregular forms, sometimes stellate, sometimes approaching double stars.

The supporting bundle is strong and ensheathing, and in our specimen never shows more than the tips of two spindles projecting. The abaxial and lateral rows show at least four pairs of small warty spindles in each row. Some smoother forms occur internally. Very minute cylindrical rods also occur.

A limp, cream-yellow specimen from Saleyer, standing 7.2 cm. high, shows some individual peculiarities, but not enough in our judgment to justify separation. It belongs to the type with narrow pointed lappets, weak internal armature of polyps, and with the lower cortical spicules not restricted to spindles and cylinders. Therefore it comes near *N. cupressiformis* and we think within it. It is slightly divergent in the fact that the larger spindles of the basal regions are longer and less strongly spinose, but the smaller sclerites are just the same as in other specimens which we have referred to this species. The supporting bundle is very strong, stronger than in the others examined, and two spindles often project for a very short distance. We think these and similar minor features are just what might be expected in any of these fluctuating species.

Another colony from Station 37 differs from the above in some details, but seems to us to be referable to the same species. The limp cypress-like colony, 9.6 cm. in height, has a creamy white colour. The short supporting bundle hardly ever projects. Among the larger spicules from the canal walls, some forms occur which are much more densely warted than in KÜKENTHAL's figure. But there are in the lower cortex the numerous compact spicules with jagged processes, as KÜKENTHAL described.

Previously recorded from Pacific Ocean, Palan Islands.

6. *Nephthya erecta* Kükenthal.

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, Nephthyiden, Teil I, Zool. Jahrb. 1904, XIX, p. 154, 4 figs.

Stat. 78. Borneo-bank. 34 M. Coral and coral sand. 2 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 M. Mud, coral and Lithothamnion. 2 Ex.

Two colonies from Station 299, of a brownish-cream colour, with conical lappets, entirely covered with polyps. The largest stands 7.5 cm. high with a spread of about 5 cm. From the base there arise four sterile branches which carry the polyp-bearing branches. We include these in the species *N. erecta* on the following general grounds: (*a*) the polyp armature, often far from distinct, shows abaxial and lateral chevron rows with 3—4 pairs in each row, and an irregular adaxial disposition of spindles; (*b*) the supporting bundle is of the ensheathing type, and though strong rarely projects; (*c*) the predominant spicules are warty spindles and the lower part of the cortex bears irregular knobbed and slightly foliate forms, some of which might be called stars. It seems to us that to make the diagnosis of *N. erecta* slightly elastic is more useful than to multiply species.

A young colony of a yellowish-white colour, rising to a height of 3 cm., of which the sterile stalk occupies 1.5 cm. The lobes are conical and rounded (sic); the supporting bundle projects only slightly, but is strongly built. Very characteristic is the abundance of irregular very warty stars towards the base of the surface of the sterile stalk. Higher up the superficial spicules are warty spindles often transversely disposed. The spicules include: (1) numerous very warty spindles, straight and curved, often unsymmetrical with larger roughnesses on the convex side; (2) swollen irregular clubbed forms with prominent thorns; (3) large curved spindles with minute conical prominences closely crowded; (4) very irregular strongly-warted forms, some of which may be called stars.

If KÜKENTHAL's diagnostic scheme be adopted we have here a number of specimens which should be referred to *Nephthya erecta*. That is to say the lappets are (in many cases at least) distinctly conical and narrowed towards the apex, the polyp-spicules are reduced on the inner side, the cortical spindles are strongly warted spindles, broadening into cylinders, with more irregular forms towards the base of the stem, where quasi-stars occur.

To the same species we refer two tree-like colonies from Station 78, Lumu-Lumu. They both show pointed conical lappets, up to 1.2 cm. in length, with polyps showing an armature of about 4 pairs of irregular chevron rows of spicules, and small rods, almost smooth, on the inner side. The supporting bundle is strong and ensheaths the dorsal side of the polyp. The spicules include long stout spindles with compound or simple prominences, and in the cortex numerous star-like thorny and warted forms.

The smaller, rather dried and more rigid specimen is 5.8 cm. in height and has a light brown colour. The other more flaccid specimen is 8.6 cm. in height and cream-coloured with tinges of brown.

Previously recorded from Pacific Ocean (Tonga-island).

7. *Nephthya grisea* Kükenthal.

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, Zool. Jahrb. XIX, 1904, p. 152.

Stat. 250. Kur. 27 M. Coral. 2 Ex.

A much branched warm-brown limp colony, rising to a height of 13 cm., with a maximum expansion of about 12 cm. The breadth of the base is 3.5 cm. The elongated lappets are terminally pointed, and the internal spicules of the polyps are small, irregularly disposed, and

rather smooth. Besides the very numerous thorny spindles of the stem there are irregular forms towards the base. This places the specimen in the vicinity of *N. grisea*, to which we think it should be referred.

The following characteristic features may be noted: (1) the outer surface of the polyps shows chevron rows with 6—8 pairs of sloping spindles; (2) the supporting bundle is strong but rarely projects; (3) the lower stem includes numerous large irregular spicules, mostly derivable from the spindle type, e. g. broad jagged plates, approximate triradiates and quadriradiates, divaricate discs with prominent processes; (4) the spindles of the upper stem are strongly thorny. Besides these there are smaller irregular sclerites not derivable from spindles. A small fragment from the tip of a branch 8 mm. long, from Kur, shows the same general features of polyp armature.

Previously recorded from Ternate and Tonga.

8. *Nephthya inermis* (Holm).

For description see: HOLM, (Spongodes inermis), Zool. Jahrb. VIII, 1895, p. 26, 3 figs.

Stat. 37. Sailus Ketjil, Paternoster-islands. 27 M. and less. Coral-bottom. 1 Ex.
Stat. 142. Laiwui, Obi Major. Reef. 1 Ex.

A limp colony of a creamy white colour is very difficult to place, but comes nearest *N. inermis* to which we refer it. The colony consists of three main branches rising from a short common stem. It rises to a height of 6 cm., and shows a spread of about 7 cm. The branches are densely covered with secondary branches bearing closely packed rounded lappets.

We refer the specimen to *N. inermis* for the following reasons:

(1) the lappets are rounded;
(2) the polyp-spicules are approximately equal;
(3) the supporting bundle does not project (at most very slightly in HOLM's description);
(4) the double rows of spindles on the polyps have 3—4 in a row (2—3 in HOLM's description);
(5) there is an indication of a basal transverse row, which seems to us to spread out laterally from the sides of the supporting bundle;
(6) there are numerous irregular double-stars and jagged capstans, besides straight and curved spindles, some with only a few spines, others richly beset;
(7) the lower canal walls may show massive 3-rayed and 4-rayed forms as well as the ordinary spindles.

A young cream-coloured colony from Station 142, with a total height of 2.2 cm. of which 1.5 cm. is stalk, shows characters nearly approaching those of the preceding specimen. All the polyps show the tentacles half expanded.

Previously recorded, if our identification is correct, from Hirudo Strait near Japan, Pacific Ocean.

9. *Nephthya pacifica* Kükenthal.

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, Nephthyiden, Teil I, Zool. Jahrb. 1904, XIX, p. 158, 4 figs.

Stat. 89. Kaniungan Ketjil. Reef. 1 Ex.
Stat. 215. Kabia-island. 701 M. Stone. 2 Ex.

Two rigid tree-like colonies from Station 215 seem to us to approach most nearly to the characteristics of *N. pacifica*. The lappets are conical but rounded at the summits; the polyps are thickly arranged on these and lie at a right angle or slightly obtuse angle to the polyp stalk.

The supporting bundle is strongly developed, consisting of about 8 to 10 strongly thorned spindles, but does not project (KÜKENTHAL's diagnosis states one or two spicules projecting). It spreads round the side of the polyp so that a transversal arrangement is seen at the base. Above this lie indistinct chevron rows of spicules, thorny at the back and sides of the polyp, smaller and smoother on the inner side. The spicules of the rind include long slightly bent spindles with short compound warts; shorter spindles very thickly covered with long jagged thorns which are often more strongly developed to one side; jagged clubs derivable from these forms; and small irregular branched bodies. The canal-walls include massive pointed spindles, up to about 1 mm. in length, with strong compound warts, and smaller spindles with fewer simple prominences.

The larger colony has a total height of 3.7 cm. of which 1.8 cm. is the sterile trunk. This has a maximum diameter of 9 mm. and shows marked longitudinal foldings obviously due to drying. The lappets are up to 8 mm. long and 6 mm. broad.

A small and withered brownish fragment from Kaniungan Ketjil shows similar characteristics.

Previously recorded, if our identification is correct, from the Pacific Ocean.

10. *Nephthya sphaerophora* Kükenthal.

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien. II. Nephthyiden. Zool. Jahrb. XIX, 1904, p. 164, 2 figs.

Stat. 81. Sebangkatan. Reef. 1 Ex.
Stat. 174. Waruh-Bay. Ceram. Reef. 1 Ex.
Stat. 248. Tiur. Till 54 M. 1 Ex.
Stat. 250. Kur-island. Reef. 1 Ex.

A cream-white colony, 5 cm. in height by 6 cm. in breadth, from Station 250, seems to us nearest *N. sphaerophora*, for the following reasons: (*a*) the lappets are roundish; (*b*) the internal polyp spicules are small smooth rods; (*c*) the abaxial and lateral armature consists of indistinct double rows, with at least five pairs in a row; (*d*) a spicule of the supporting bundle may be seen projecting in some polyps; (*e*) there are numerous very jagged spindles in the upper cortex, with transitions to very irregular forms, and (*f*) numerous spindles in the lower cortex with a large array of branched thorns.

A young cream-grey colony from Station 248 has a height of 2.7 cm. Of this 1.7 cm. consists of the basal stalk, which has a diameter of 5 mm. The polyps in this specimen are rather less crowded on the somewhat more conical lappets, but the general spiculation comes closest to *N. sphaerophora*, as does also the armature of the polyp, with the internal spicules small smooth rods.

Also a small colony and fragments from Station 81 and a fragment from Station 174 agree closely with the other specimens.

Previously recorded from Pacific Ocean (Viti).

11. *Nephthya striata* Kükenthal.

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, Nephthyiden, (I), Zool. Jahrb. XIX, 1904, p. 166, 2 figs.

Stat. 115. Kwandang Bay. Reef. 1 Ex.

A very light brown tree-like colony, 7 cm. high, from Station 115. The rigid basal stem, 2.5 cm. broad, shows numerous striations, and is cleft very near the base into numerous branches which lie closely appressed. The lappets are rounded and flattish, 5—6 mm. broad and about 4 mm. high, and bear very closely set small polyps which have a height of about 0.6 mm. and a breadth of 0.5—0.6 mm. The armature of the polyp shows an irregular arrangement of very thorny spindles, without very definite chevrons; and on the inner side are found rather smooth rods with very slight thorns. The supporting bundle ensheaths the dorsal side of the polyp and very occasionally projects slightly.

The spiculation also agrees very well with KÜKENTHAL's description, including (*a*) long strong spindles covered with compound or simple warts, often showing one long pointed thorn or branch, (*b*) smaller very warty spindles, sometimes with the warts more heavily developed on one side; (*c*) more compact irregular forms.

Previously recorded from Red Sea.

12. *Nephthya tenuis* (Kükenthal). (Plate XXVII, Fig. 2).

For description see: KÜKENTHAL, Alcyonaceen von Ternate, Abh. Senckenb. naturf. Ges. Frankfurt, XXIII, 1896, p. 103.
—— Versuch einer Revision der Nephthyiden, II, 1904, p. 533.

Stat. 301. 10° 38′ S., 123° 25′.2 E. 22 M. Mud, coral and Lithothamnion. 1 Ex.

We refer to the above species a limp cream-coloured colony from Station 301. Described originally by KÜKENTHAL as a separate species, *Spongodes tenuis*, it was merged by him later with *Dendronephthya robusta* (Kük.) being considered as a young specimen of that species. From his original description and figures of *S. tenuis*, however, we feel convinced that his specimen was a true Nephthya; and as our colony agrees with the details of the description of *S. tenuis* rather than that of *S. robusta* Kükenthal, we have revived *S. tenuis*, transferring it to the genus Nephthya.

From a flaccid sterile stalk 2.5 cm. long there arise three main branches with an average length of 3.5 cm. These give off secondary branches which bear the elongated, digitiform lappets. The polyps occur irregularly all over their surface.

There is a well defined supporting bundle with one or two dominant median spindles, projecting not more than about 0.2 mm. beyond the polyp-head, which is borne almost at right angles to the stalk. The latter is about 1.4 mm. long. The polyp shows a dorsal and lateral armature of about four pairs of spicules in chevron, and ventrally a mass of small smooth rodlets, about 0.08 mm. long, which are also found on the inner side of the polyp stalk. The spicules of the upper stem cortex are warty spindles of varied lengths up to 1.2 mm. In the lower stem cortex there are warty spindles; also shorter spindles, often with strong, median, jagged thorns arising on one side, and numerous small very irregular bodies. The canal walls

contain warty spindles up to 1.3 mm. long, with extraordinary, almost rod-like outgrowths, up to 0.2 mm., arising at right angles or an acute angle to the main axis (Plate XXVII, Fig. 2). There are also smoother spindles and triradiates with simple prominences. The branched spindles of the canal walls agree with the description of those in the upper rind of *S. robusta*.

Previously recorded from Ternate.

13. *Nephthya thujaria* Kükenthal.

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien. II. Nephthyiden. Zool. Jahrb. XIX, 1904, p. 150, 5 figs.

Stat. 313. Saleh-Bay. Up to 36 M. Sand, coral and mud. 1 Ex.

A vigorous flaccid colony of a brownish-madder to grey-cream colour has a height of 9.6 cm. and a spread of 12.5 cm. Numerous branches arise from a very short common stem, and bear conical lappets terminally rounded-off.

We have referred it to *N. thujaria* for the following reasons: (1) the polyp armature consists of indistinct double rows, about six in a row; (2) the polyp head is bent down at an acute angle; (3) the supporting bundle is strong, of the ensheathing type, and does not project; (4) the polyp spindles are marked by prominent long thorns, usually simple; (5) the cortical spicules are densely thorny spindles, sometimes cylinders, sometimes with compound roughnesses; (6) the canal wall spicules are massive spindles with numerous strong thorns.

It must be noted, however, (1) that the massive spindles are sometimes triradiate and (2) that the lower cortex includes small irregular spicules which may be evolved from the irregular branching of a simple capstan or two-headed-rodlet type. These two forms are not included in KÜKENTHAL's description of his specimens.

Previously recorded from Carolines, Pacific.

14. *Nephthya tongaensis* Kükenthal.

For description see: KÜKENTHAL, Versuch einer Revision etc. II. Nephthyiden. Zool. Jahrb. 1904, XIX, p. 163, 4 figs.

Stat. 144. Damar-Island. 45 M. Coral bottom and Lithothamnion. 1 Ex.

A light brown colony from Station 144 (45 m.), with roundish to conical lobes thickly beset with polyps, showing a distinct supporting bundle hardly projecting. The total height of the colony is 4 cm., of which 1.4 cm. belongs to a common base, this again dividing into two sterile trunks 1.5 cm. in height. The characters correspond on the whole with KÜKENTHAL's description, noteworthy being the strong compound tubercles which arise from many of the spindles and are often much higher on one side than on the other, especially on the curved forms. A common length for the long thorny spindles is 1.4 mm.

Previously recorded from Tonga.

15. *Nephthya capnelliformis* n. sp. (Plate X, Fig. 1; Plate XXIII, Fig. 7).

Stat. 60. Haingsisi. 23 M. Reef. 1 Ex.

A somewhat flaccid colony with a short stout trunk about 1.7 cm in height which divides

into two main branches rising to a height of 6 cm. The branches give off numerous secondary branches which bear lappets either directly or on separate racemes These lobes vary considerably in size and shape — the longest are somewhat rounded cones, 5.5 × 3 mm., but very commonly several very small lobes, some conical, some practically round in shape, are closely crowded together and form a dense rounded mass of polyps up to 7 mm. high and 7 mm. in diameter.

This specimen in many respects approaches most nearly to *N. crassa* Kükenthal, agreeing closely with that species in regard to mode of growth and especially in the spiculation of the stem, both in the rind and the canal walls. It differs, however, from it in the size, shape and armature of the polyp, and especially in the shortness of the polyp stalk.

The polyps are very small and, what is most characteristic, have an extremely short and ill-defined polyp-stalk on which the head is borne at an obtuse angle, the whole forming a rather curved Capnella-like polyp. The inner wall of the stalk is so short that in many cases the polyp-head seems to arise on the inside directly from the twig. In some of the polyps it is quite impossible, so small is the flexure, to measure polyp-head and stalk separately. Such a one may be up to about 0.7 mm. from tip of polyp to base of stalk on the outer side. In those showing more distinct separation of the head the stalk is 0.3—0.4 mm. and the height of the polyp is also 0.3—0.4 mm. The average breadth of a polyp head is 0.35 mm. The supporting bundle is not strongly developed, and consists of a varying number of loosely disposed spindles in an irregular longitudinal arrangement sometimes showing fairly definite chevron rows, which spread round the sides of the stalk. There are frequently about 6 spindles in a bundle. The maximum length measured was 0.55 mm., but the majority do not exceed 0.4 mm. They are covered with rather distant simple low prominences which tend to be exaggerated in number and size towards the two ends. The armature of the polyp is very dense on the dorsal surface and a little distance round the sides, numerous thorny spindles being irregularly arranged in a thick mass. These vary in length from about 0.18 mm. to much smaller, rather smoother forms, 0.04 mm. long. The very short inner wall of the polyp is most commonly devoid of spicules, but sometimes shows one or two very small sclerites.

The spicules from the canal walls are massive warty spindles densely covered with small compound warts, often disposed in transverse rows. Two very distinct types occur, with pointed and with very obtuse ends.

The following measurements were taken: 1.1 mm. × 0.18 mm.; 0.7 mm. × 0.2 mm.

In the rind of the upper branches, tending to a transverse arrangement, lie numerous short spindles with prominent simple projections with an average length of 0.18 mm. and breadth of 0.02 mm. In the lower cortex are found slightly larger stouter spindles thickly covered with high conical prominences. Average dimensions are 0.3 × 0.05 mm.

There are also numerous irregular spicules including short jagged cylinders, and a few that approach clubs with a slight flattening of the broader end; 0.18 mm. × 0.08 mm.; 0.1 mm × 0.02 mm.

16. *Nephthya cervispiculosa* n. sp. (Plate X, Fig. 4; Plate XXII, Fig. 8).

Stat. 43. Sarassa. 30 M. Coral. 1 Ex.
Stat. 49. 8° 20′.5 S., 119° 4′.5 E. 369 M. Coral and shells. 1 Ex.
Stat. 50. Labuan Badjo, Flores. Up to 40 M. Mud, sand and shells according to locality. 1 Ex.

Stat. 104. Sulu. 14 M. Sand. 2 Ex.
Stat. 133. Lirung, Salibabu-Island. Up to 36 M. Mud and hard sand. 1 Ex.
Stat. 209. Kabaëna-Island. 22 M. Coarse sand. 2 Ex.
Stat. 303. Haingsisi. Up to 36 M. 1 Ex.

A limp light brown colony from Kabäena Island, consisting of a sterile stalk about 3.5 cm. in height and 6 mm. in breadth, surmounted by three main branches with polyps in lappets. The total height of the colony is 6.5 cm.

The polyps are small, about 1 mm. in height; the supporting bundle is distinct but does not project far, if at all. The canal walls have numerous small spindles.

The dorsal aspect of the polyp shows clear chevron rows of seven pairs of spindles; these are reduced to about five pairs laterally and there are only a few ventrally.

This species is in some ways near *N. hartmeyeri* Kükenthal and *N. complanata* Kükenthal, but the spiculation is different, the most outstanding features being: (1) the great length of many of the thorns (0.06 mm.) on the straight or curved spindles, (1.4 × 0.15 mm.); (2) the asymmetrical development of these thorns, which predominate for instance on the convex side of a bow-shaped spindle; (3) the sparseness of small irregular bodies of the capstan type. Many of the prominences are tapering and unbranched; others show the beginnings of three or four divisions, suggesting an antler.

A rigid contracted colony from Station 49, of a light brown colour, consists of a heavily spiculated sterile trunk, 1.4 cm. in height and 4 mm. in diameter, and a small number of hillock-lappets so much contracted that the polyps are in contact. The polyp-bearing part is only 8 mm. in height. Superficially this appears somewhat different from the type specimen of *N. cervispiculosa*, but the spicules are almost the same and so is the armature of the polyps. The conspicuous feature in the spicules is the huge size of the prominences, which are often compound, and sometimes suggest antlers. The supporting bundle is strong but hardly projecting; the anthocodia is bent inwards almost at a right angle.

A yellowish brown colony from Station 43, Sarassa, rising to a total height of 6 cm., of which 3.7 cm. go to the sterile densely spiculose stalk. The polyps are loosely disposed in elongated lappets.

The supporting bundle usually projects slightly; the polyps are bent at right angles to the stalk; the anthocodial armature consists of four dorsal rows of about five to six or seven pairs of chevron spindles. The other rows are only represented by irregular spicules.

The spicules include the following types:

(*a*) substantial slightly curved spindles, densely covered with high, very compound warts (1.3 × 0.2 mm.);
(*b*) slender curved spindles with small conical warts, not very numerous (1.5 × 0.1 mm.);
(*c*) curved spindles with asymmetrical compound prominences, higher on the convex side (1.1 × 0.15 mm.);
(*d*) pseudo-clubs with very high compound prominences;
(*e*) branched or multiradiate forms, tuberculate triradiates (with 0.3 mm. to a ray), and irregular starfish-like types;
(*f*) small irregular bodies.

A very young colony of a cream colour from Labuan-Badjo arises from a piece of brown Alga to a total height of 16 mm. The stalk has a height of 7 mm. and a breadth of nearly 3 mm. It bears characteristic conical lappets of close-packed polyps, with inconspicuous supporting bundles. The spicules are like incipient forms of the big colony, that is to say they are straight and curved spindles with long prominences often asymmetrically disposed. No capstan-like forms were to be seen; indeed all the spicules were spindles or slight modifications of these.

A young upright white colony from Haingsisi shows mode of growth and spiculation (with coarse branched tubercles) agreeing most nearly with those of *N. cervispiculosa*. The total height is 3.2 cm., of which 2.2 cm. is flexible stalk, with a maximum basal diameter of 6 mm. narrowing to 3 mm. at the top. The lappets are conical and elongated (about 6 × 2.5 mm.). The polyps have a strong supporting bundle with sometimes one or two spicules slightly projecting. They are bent at an acute angle to the stalk. The polyp armature is extremely difficult to analyse with accuracy in this specimen, but there do not seem to be more than 5 chevron rows in any 'point'.

A dark coloured specimen from Station 104 shows the same spiculation, but includes some massive broad spindles with low warts so close that there is a suggestion of transverse rows. Some of the spindles are very unsymmetrical, with huge fangs on the convex side. There are numerous irregular bodies from the cortex near the base, and some of these might be called pseudo-stars. Another feature of this slightly aberrant form, which has however the characteristic antlered spindles, is that parts of the lower cortex show short spindles, close-packed but very distinct from one another. They are almost rodlet-like, being short for their breadth. In general features, however, this specimen seems to us to be referable to this new species, *N. cervispiculosa*.

A colony from Station 209 shows a more markedly white colouration. The spiculation and armature of the polyps is, however, typical.

This species is well-marked by the prominence and often compound branching of many of the thorns on the spindles and derivatives of spindles. It may perhaps serve to bring the genera Nepthya and Stereonephthya more closely together.

17. *Nephthya gracillima* n. sp. (Plate XIII, Fig. 1; Plate XVI, Fig. 3).

Stat. 213. Saleyer. Up to 36 M. Coral reefs, mud and mud with sand. 1 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion; sand and coral. 1 Ex.

Four much branched limp yellowish colonies. The best specimen is about 22 cm. in total height, of which only about 1.5 cm. goes to the basal stalk. Yet the main part of this colony has only a few branches in its basal portion.

The lappets are very numerous, much elongated, narrow, a common length being 1.8 cm. with a thickness of 2 mm.

The ovoid polyps have a distinct supporting bundle of the ensheathing type, not projecting. The spicules on the ventral surface of the polyp are smaller and fewer, but there are none of the smooth rod type.

All the superficial spicules are spindles, varying greatly in dimensions, densely warted, often with very prominent tooth-like projections, stronger on one side. No irregular forms occur. On the lower canal walls there are stout spindles with low conical warts.

If KÜKENTHAL's scheme be followed this species should be placed among those with conical and pointed lappets, and with the ventral spicules smaller. But it certainly does not agree with any of the species in this section.

Nephthya gracillima n. sp. var. *minor*.

Stat. 213. Saleyer. Reef.

As a variety of the above we rank a specimen (from Saleyer) with the same general features, about 14.3 cm. in total height, of which only about 2.5 goes to the basal stalk.

The polyps are slightly smaller, but there is the same short ensheathing type of supporting bundle, and weak irregular spiculation on the ventral surface.

And yet there are distinct differences in the spiculation:

(*a*) the large spindles of the canal walls bear larger and more compound warts, often so close together that they suggest zoning;

(*b*) occasional triradiates occur among these larger spicules of the spindle type;

(*c*) there is a sparse representation of small irregular sclerites.

The same unsymmetrical prominently toothed spindles are abundant.

It seems to us most reasonable to rank this merely as a variety of *N. gracillima*.

18. *Nephthya junipera* n. sp. (Plate XXVII, Figs. 1 and 5).

Stat. 60. Haingsisi. Reef. 3 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion, sand and coral. 1 Ex.

Three very flexible and bushy colonies from Station 60, with the strong supporting bundles giving a gorse-like spinous appearance to the lappets, require the establishment of a new species. It comes near to *N. pacifica* which, however, is a very rigid type with rounded tips to the lappets. The sterile stalk is very short, early dividing into broad flexible branches which again divide into shorter twigs. On the twigs are borne the elongated conical lappets, in expanded colonies almost digitiform. Small lappets and occasionally single polyps may arise from the branches themselves; the lappets may attain a length of 1.5 cm. with a breadth of only 4 mm.; a common length however is 8 mm. with a breadth of 3 mm. They taper to the tips, which cannot be called rounded. The polyps are not so crowded as in the majority of Nephthya species, so that a very expanded lappet has a somewhat Stereonephthya-like appearance. The supporting bundle of the polyp (Plate XXVII, Fig. 1) forms an exceedingly strong and straight spicular triangle lying along the polyp stalk, and consists of about 6 or 7 straight or slightly twisted spindles, up to 2 mm. long with a breadth of 0.17 mm., which may project 0.6 mm. but frequently rather less. These spindles are covered with short, sharp thorns, except for the projecting tips which are smooth. The very short polyp is borne at right angles or at a slightly obtuse angle to the bundle, with a height of 0.35—0.5 mm., and a maximum breadth of 0.9 mm. The armature consists on the dorsal side of three pairs of very thorny curved spindles in chevron; on the sides are about two pairs of more weakly thorned chevroned spindles, with generally one transversely arranged spindle lying at their base. Common dimensions of a polyp spindle are 0.3×0.03 mm.

On the inner surface of the polyp there are very numerous small smooth rodlets with bluntly rounded ends. These vary considerably in length, some being so small as to be almost spherical, 0.02 × 0.015 mm.; a common size is 0.04 × 0.015 mm. Similar small smooth rodlets also occur in the polyp-stalk and also densely scattered throughout the cortex of the lappets; the majority have dimensions similar to those of the polyp, but some attain a greater length, being narrow rodlets up to 0.09 × 0.01 mm.

In the upper cortex of the branches there are long thorny spindles, some slightly bent, up to about 1.5 × 0.08 mm. in size. The basal cortex shows very strong spindles covered with compound warts: the largest measured was 1.6 mm. in length with a breadth of 0.15 mm.; a common length is 0.9 mm. As the spindles decrease in size, the roughnesses become stronger and more prominent; some of the smaller forms show one or several branch-like warty projections up to 0.1 mm. long. These finally lead to almost spherical exceedingly rough bodies with a diameter of about 0.4 mm. (Fig. *b*). In addition to these rough warty forms, all of which can be considered as derivatives of the spindle type, there are much smaller irregular forms, about 0.15 mm. in diameter, with several smooth, rather blunt irregular outgrowths.

In the canal walls lie strong, generally slightly bent spindles with pointed ends; covered with rather less numerous prominences, simpler than those of the long spindles of the basal rind. Dimensions are 0.8 × 0.12 mm. A few triradiates and quadriradiates (Fig. *a*) occur. The colour varies from almost white to a very deep cream colour. The largest colony, from Station 60, had a total height of 9 cm. with a spread of 11 cm. The stem and branches are rather creased and flattened, due obviously to the preservation. The very short sterile stalk has a height of 2.2 cm., with a maximum basal diameter of 2 cm. This divides into four almost equal branches with diameters of about 1.5 cm.; these almost immediately give rise to the lappet-bearing twigs, which may again divide. The colour is a deep cream; the texture of the stem is tough and rather gritty; and the polyparium is distinctly prickly to the touch.

A smaller colony from the same station, with a height of 7 cm. and a spread of 5.2 cm., has two branches. The lappets do not exceed 1.2 cm.

A very soft and flexible colony from Station 258 agrees in growth, general spiculation and the armature of the polyp, but the supporting bundle is in most of the polyps slightly more weakly developed, not projecting for more than 0.35 mm., so that the colony is not so typically spiny to the touch.

19. *Nephthya sibogae* n. sp.

Stat. 115. Kwandang. Reef. 1 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. Reef. 1 Ex.

We are unable to refer a light brown flexible colony from Station 115 to any previously described species of Nephthya. The growth is somewhat tree-like, with a sterile stem which branches and rebranches into the bushy polyp-bearing upper portion. The total height is 5.5 cm., the length of the stem 2.8 cm. with a maximum diameter of 1.5 cm., and the maximum spread of the upper polyp-bearing region is 3.3 cm.

The lappets vary greatly in size and shape; the smaller ones about 3 mm. high with more rounded summits, the larger up to 8 mm. × 4 mm. and conical with rather pointed summits.

The polyps are not as densely crowded as in many Nephthyas, the stem being frequently visible between two polyps. A polyp has a height, measured on the outer side, of 0.5—0.8 mm., a breadth of 0.65—0.7 mm., a polyp-stalk of about 0.6 mm.; it is borne at right angles or at a slightly acute angle to the stalk. The supporting bundle is strong and does not project, often curving round the polyp head; it consists of about 6—8 strong, rather twisted spindles, up to 1.2 × 0.1 mm., covered with numerous fine warts. The polyp armature consists of chevron rows of 3—5 pairs of thorny bent spindles, about 0.2 mm. long, and on the inner side of polyp and stalk a close mass of irregularly arranged small, rather smooth rods about 0.08 mm. long and 0.001 mm. broad.

The spicules of the canal walls are stout pointed spindles, up to 0.9 × 0.12 mm., with few simple warts, also some triradiates. In the rind are found (*a*) strong massive spindles with numerous compound warts, many with long sharp thorns on one side (0.85 × 0.1 mm.; 0.53 × 0.1 mm.); others are slightly curved, twisted, or bent sharply in the middle, often with the spines markedly developed on the convex side;

(*b*) club-like forms with large spines at one end;

(*c*) smaller irregular forms (average length 0.15 mm.) with few long, generally blunt, outstanding processes. Some of these irregulars are crescents with two basal processes, approaching the Lemnalia quadriradiates.

A very badly preserved colony from Station 301, with a height of 5.4 cm., shows the same features of spiculation and polyp structure, but the whole colony is withered and twisted, and it is difficult to judge the shape and size of the lappets.

Genus **Dendronephthya.**

In 1922 Prof. W. Rae Sherriffs published a paper in the Proceedings of the Zoological Society, N° III. pp. 33—77 on "Evolution within the Genus Dendronephthya (Spongodes)" based on the examination of ninety-three specimens belonging to this collection. These specimens he referred to twenty-two species, including three new species. There are, however, one hundred and twenty other specimens in the collection, and these are here incorporated.

We have confirmed the majority of the conclusions arrived at by Dr. Sherriffs, but have felt compelled to establish two new species for specimens which he referred to two already described species, viz. *D. clavata* and *D. cervicornis*. These we now refer to *D. amoebisclera* n. sp. and *D. halterosclera* n. sp. respectively. Of the remaining twenty species we have examined eighty-two other specimens, belonging to ten species.

There are, however, in addition to the specimens belonging to these twenty-two species, thirty-eight others which we have referred to ten species, five of which are new. On page 104 will be found a list of all the species in the collection with the number of specimens and the localities.

All who have worked at Alcyonarians will agree as to the difficulties presented by the genus Dendronephthya or Spongodes. For here we have to deal with a multitude of species within a relatively narrow range. Thus Kükenthal, in his "Versuch einer Revision der Alcyonarien: II. Die Familie der Nephthyiden, 2 Teil", 1905, deals with no fewer than eighty-seven species; and Henderson, in the "Alcyonarians of the Indian Ocean", Part II. 1909, with

another series of sixty different from the former. And yet in both cases the species are described in minute detail.

The continual experience in investigating a collection of representatives of this genus is that, in spite of an initial determination to refrain from adding to the already large number of described species, one is forced to do so. And there is no denying that each of these new forms has a distinct individuality. This experience inevitably raises a number of aetiological questions which it may be useful to state, although they cannot be more than partially answered. Some of them at least could only be answered by an investigator having at his command a large number of specimens of any given form.

The outstanding features which present themselves are the following:

A. That the specific distinctions are all of a relatively trivial sort, such as mode of branching, grouping of polyps, length of polyp stalk, strength of supporting bundle, presence or absence of a pseudo-crown, the number and the arrangement of the spicules in the anthocodial points, the distinction between the spicules in the cortex of the polyparium and those of the sterile stalk, and the nature of the spiculation of the canal-walls.

B. That the species differ one from the other to a large extent in the congeries or collocation of such characters as we have mentioned; that is to say, two species with similar anthocodial armature may differ in the mode of branching, and vice versa.

C. That within the limits of a colony there is, in most cases, relatively little variability of architecture, though there are, of course, quantitative differences in size of spicules, strength of supporting bundle, and the like, which are merely growth characters. We emphasize the saving clause "in most cases", in view of the occurrence of a number of very variable species, such as *D. gigantea,* where there is great variability of anthocodial armature in one and the same colony. Later on particular attention is paid to the interesting form referred to; and it does not stand alone.

The multiplicity of form-detail within a narrow range admits of various interpretations:

I. (*a*) It may be urged that the observed differences are individual, not specific, characters. If the observed differences are purely individual, they may be either extrinsic modifications or of the nature of intrinsic variations. And before considering these alternatives separately, we may note the general fact that in many cases a considerable number of specimens from the same or different localities agree together. Thus KÜKENTHAL speaks of twenty specimens of *D. savignyi,* twelve of *D. gigantea*, ten of *D. rubra*, seven of *D. pumilio*; while we have examined twenty-five of *D. brevirama*, twenty of *D. ehrenbergi*, eighteen of *D. gigantea*, seventeen of *D. habereri*, and twenty of *D. amoebisclera* n. sp.

Therefore the general suggestion that observed differences are purely individual does not apply in every case. At the same time, the unsatisfactoriness of basing a new species on a single specimen when the specific characters are of such a tenuous nature is plain.

(*b*) It may be said that the observed differences are of the nature of exogenous modifications correlated with environmental peculiarities. Against a too ready acceptance of this easy solution is the occurrence of the same form in widely separated localities. For example, *D. robusta*

is reported from Ternate, Borneo, Zanzibar, and Madagascar; *D. florida* from Hong Kong, the Philippines, and Port Jackson (Australia).

It may also be pointed out that certain factors in the immediate environment in different parts of a large colony must show considerable diversity, e.g. as regards shelter; and yet, as already pointed out, there is rarely diversity within a colony except in colour and the like.

(*c*) It may be, however, that the observed differences are expressions of individual intrinsic variability, not correlated with any peculiarities of environment. There is no way of testing this interpretation until numerous similar specimens from the same locality and of the same age and size are examined by some investigator with abundance of living material at his disposal.

II. It may be that the multiplicity of distinct forms within a narrow range is due to cross-fertilization between allied species. It is quite conceivable that species which have attained individuality and fixity in the course of isolation and inbreeding may be brought into contiguity by subsequent spreading or removal of barriers. In such a case, analogy points to the likelihood of numerous new patterns arising by permutations and combinations of the previously segregated characters. This hypothesis is certainly suggested by the fact that two species may agree in anthocodial armature and yet differ in mode of branching, or may agree in having a foliaceous collar and yet differ in the nature of the supporting bundle. In short, in the distinctions between species there is a distinct suggestion of the shuffling of unit characters.

III. There seems to be a third possible interpretation — namely, a mutation of species apart from any hybridizing influence. It may be that certain widespread and strongly established species such as *D. gigantea*, *D. ehrenbergi*, and *D. brevirama* have been the stocks from which mutations have been thrown off after the fashion of *Œnothera lamarckiana*.

An indirect argument in favour of this interpretation may perhaps be found in the possibility of discriminating similar radiations of evolution within the three great groups: Glomerates, Divaricates and Umbellates. A more direct argument may be found in the variability of certain species such as *D. gigantea*, to which reference has already been made. As KÜKENTHAL remarks, „Aus diesen Beschreibungen geht hervor, dass *D. gigantea* eine in ihrem Aufbau sehr variabele Art ist". ("Revision", p. 553).

Divisions of the genus.

KÜKENTHAL arranged the species of Dendronephthya in three main divisions: (I) Glomeratae; (II) Divaricatae; (III) Umbellatae, giving precision to similar suggestions by previous workers, such as HOLM.

I. The Glomeratae are characterized by:

(*a*) the comparatively slight branching of the polyparium;

(*b*) the grouping of numerous bundles of polyps into roundish bunches which very markedly break up the surface of the polyparium.

There is a marked definiteness about the Glomerate division which suggests "naturalness" and makes it easy to refer a species to the group. Plate XVII, Fig. 1 is a diagrammatic representation of what is meant by the Glomerate habit of growth.

II. The Divaricatae are characterized by:

(*a*) the profuse branching of the polyparium;
(*b*) the length and slenderness of the twigs;
(*c*) the divergent separateness of the polyp bundles;
(*d*) the absence of anything than can be called bunches of the Glomerate type or umbels of the Umbellate type.

It should be noted, however, that a Divaricate polyparium often has a continuous contour like that of a well-pruned tree (Plate XVII, Fig. 2).

III. The Umbellatae are characterized by:

(*a*) the umbel-like or sometimes corymb-like aggregates formed by the terminal twigs, the heads of the umbels being bundles of polyps;
(*b*) the disposition of all or most of the polyp heads on the surface of the colony (Plate XVII, Fig. 3).

Thus the Umbellatae differ from the Glomeratae, and agree with the Divaricatae in showing much minor branching. They differ from the Divaricatae in the presence of umbels or corymbs of polyp bundles and in the entirely superficial arrangement of the polyp heads. As this continuous superficial disposition is obviously advantageous — giving all the polyps equal exposure for nutritive and respiratory purposes — we may regard the Umbellatae as the latest expression of evolution of the Dendronephthya polyparium.

Of minor importance is the question whether or not the umbels combine into large secondary bunches rising like hillocks on the surface, or the question of the shape of the polyparium whether flattened or quite symmetrical, whether spherical or disc-like, and so on, for these features probably depend to a large extent on local environmental conditions.

While there appears to be a deep constitutional contrast between Glomerates, Divaricates and Umbellates, we cannot but regard it as fallacious to propose a major splitting within these three sections on growth characters such as the uniformity or irregularity of the surface outline. Similarly it seems to us that there is a strong risk of fallacy in KÜKENTHAL's *Spinulosa*-group where the polyparium has no continuous contour.

Specific Characters.

Before considering the specific characters selected for examination and criticism, let us recall the external spiculation of a Dendronephthya polyp (Textfig. 1).

The ascending order is as follows:

(1) The supporting bundle (Stützbündel). This may consist of (a) several spicules more or less of the same size (the ensheathing type), or (b) one or more may be distinctly longer than the others (the buttress type). These spicules may attain a length of 3 or even 4 mm. and may project beyond the anthocodia for a distance of 0.5—1.5 mm. In addition to the spicules of the supporting bundle proper, there may be a few accessories which often mingle with those of the polyp stalk.

(2) The anthocodial armature. This is composed of eight points, each consisting of a number of spicules arranged more or less en chevron. When the anthocodiae are fully or partially expanded, this arrangement is very marked, but when the anthocodiae are retracted, one or more of the basal pairs may assume a more or less horizontal position, giving the appearance of a pseudo-crown. This "crown" must not, however, be looked upon as comparable to the crown in e. g. Cactogorgia, Siphonogorgia, or the Axifera.

Between each pair of points, tiny spicules are frequently found. These may be termed intermediates, and it should be noted that they are very variable, and therefore of no more than subordinate diagnostic importance.

(3) Tentacles. On the aboral surface of the tentacles there may be a more or less dense armature of small spicules. When the tentacles are expanded these often show an en chevron arrangement, but when retracted they may assume a more horizontal position.

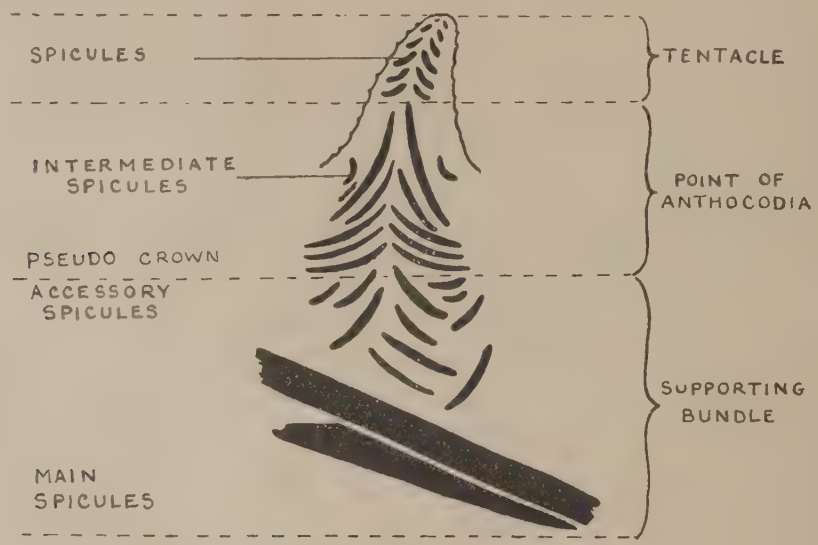

Fig. 1.

If the Glomerates, Divaricates, and Umbellates be held to represent three distinct stocks or lines of evolution, the particular problem is to discover whether similar morphological radiations can be discerned in each of these main divisions. A prior question is: What characters can be regarded as having real morphological importance?

Negatively, it is quite plain that little emphasis can be laid on the size of the colony, looseness or density of branching, amount of sterile stalk or colour.

Positively, the features which seem most indicative of relationship are, in order of importance:

(1) The architecture of the anthocodial armature — e. g., the number of spicules in each point, and their differentiation within the point, this being of much more importance than the degree of projection, which depends so much on the state of contraction or expansion;

(2) the differentiation of the supporting bundle;

(3) characteristic features in the spiculation, such as the occurrence of particular forms in special regions of the colony — e. g. the sterile stalk, canal-walls.

As the length of the polyp-stalk may vary notably within one colony, this cannot be regarded as an important feature, though in certain cases it may be a useful diagnostic feature that the polyps are, it may be, sessile or with very long stalks.

In studying the possible relationships of different species, the following provisional assumptions may be made:

(*a*) That the presence of very numerous small spicules in the anthocodial points is more primitive than a smaller number of large spicules.

(*b*) That a supporting bundle with a large number of spicules tending to form a sheath is a more primitive condition than the differentiation of a bundle out of a few large spicules to form a buttress. And here it may be noticed that in a few species — e.g., *D. clavata*, the supporting bundle is so slight that the polyps may at first sight be mistaken for those of a Eunephthya, where there is no supporting bundle whatever.

(*c*) That the more primitive forms show:

(1) less variety of spicule, e.g. that spindles predominate throughout, and less differentiation of spicules in the anthocodial point;

(2) less localization of particular forms of spicule in particular areas. Thus there can be no doubt that the presence of special interlocking spicules in the sterile stalk is a later differentiation;

(3) the presence of few spicules in the canal-wall.

Thus *D. pütteri* with a multitude of canal-wall spicules is in other respects highly specialized. Conversely, it is interesting that *D. clavata* with no canal-wall spicules belongs to what may be regarded as the more primitive type. So careful a worker as KÜKENTHAL attached great importance to the canal-wall system of spicules, and it is obviously important to inquire what correlation there is between the primitiveness of a species and the number and nature of the canal-wall spicules. The unsatisfactory feature here is that the examination of the canal-wall spiculation has not been made uniformly by the various investigators. Minute spicules which escape attention in a fragment of canal-wall when boiled down may be found by examining a piece intact. But one is not uniformly successful with the sample examined.

As regards number and differentiation of anthocodial spicules it seems to us possible to refer all the species to one or other of the following six grades, ranging from the most primitive (I.) to the most specialized (VI.): (Plate XIX, figs. 1—6).

VI. Only one pair of spicules, or even but a single spicule replacing all the others in each point above the pseudo-crown; (Plate XIX, Fig. 6);

V. reduction of the point so that one pair (or, it may be, one of the uppermost pair) predominates over the others (not above three pairs in total number) which may form a pseudo-crown; (Plate XIX, Fig. 5);

IV. one pair or one spicule predominating over 3—4 others (Plate XIX, Fig. 4);

III. about 4—6 pairs, the uppermost slightly specialized, (Plate XIX, Fig. 3);

II. about 6—8 pairs, strong and uniform, (Plate XIX, Fig. 2);

I. about 8—12 pairs in each point, numerous and small, (Plate XIX, Fig. 1).

The suggestion has been made that the differences between the Glomerate, Divaricate, and Umbellate groups are not of taxonomic value, but depend on conditions of growth. On this view, the occurrence of a species with the same anthocodial armature in each of the three groups

would not mean that a similar specialization had occurred three times on different lines of evolution; it would merely mean that one and the same species occurred in three different vegetative forms: Glomerate, Divaricate, and Umbellate, these depending entirely on growth conditions.

But against the interpretation of the three groups as merely vegetative forms dependent on environmental conditions, two considerations may be urged. (1) In many cases the Glomerate, Divaricate, or Umbellate structure is clearly expressed in young forms 1—3 cm. high. (2) When exactly the same anthocodical armature occurs in two or all of the three groups, the two or three species in question differ in other details, such as the nature of the supporting bundle, and the spiculation of the lower cortex. This surely implies that the species in question are radically different, and that the Glomerate, Divaricate, or Umbellate structure is more than vegetative and environmental.

Starting with the Glomerates, the following may be regarded as illustrations of primitive types:

1. In the *savignyi*-group:

D. argentea with irregular arrangement — most primitive of all, with ventrally and laterally nothing more than minute cylindrical corpuscles; *D. fusca* with indefinite double rows of about 6 pairs — on a slightly higher level, but also showing primitiveness in the numerous quite small elements; *D. savignyi* with indefinite steep double rows reduced to 6, — somewhat higher on the scale, but also showing, like the preceding, very numerous small cylindrical bodies.

2. In the *hemprichi*-group:

D. clavata, where there are 10—12 pairs in each double row and a very weak supporting bundle. It may be noted that this group shows a gradual reduction in the number of spicules composing each point, 5—7, 5—6, 4, 3, 2 and 1, reaching a climax in forms like *D. punicea*, where there are a couple of slightly hockey-club like spicules occupying the whole area which in *D. clavata*, for instance, shows 10—12 pairs.

3. In the *studeri*-group:

Here there is, on the whole, a more differentiated group, with forms like *D. mayi*, with 6—8 pairs in each point, to be ranked as relatively primitive compared with the highly specialized *D. köllikeri*.

So with the Divaricates, on this view the series begins with forms like *D. japonica* with 8 pairs in each point, — a very primitive arrangement — and ends with *D. suensoni*, which has but one pair. As intermediate between grade II., which is defined as having numerous pairs regularly arranged in each point (grade I possessing very numerous irregular pairs), and grade III., with 5—6 pairs, cases like *D. armata* occur, where the lateral points may have 9 pairs. There must also be noticed *D. caerulea*, inclining to be primitive in minuteness but not in number of spicules, while *D. klunzingeri* may be considered as rising out of grade II. because one of the uppermost pairs is markedly differentiated.

It is interesting to find that in so many of KÜKENTHAL's minor groups the arrangement of the species ends in forms with one large pair in each anthocodial point.

Again, in the *rigida*-group, *D. microspiculata* with 6—8 pairs, is undoubtedly primitive, though the uppermost again is slightly larger and projecting.

In the third great division — the Umbellates — grade I. is represented by *D. australis* with its very numerous, small polyp spicules.

In the *dendrophyta*-group, *D. villosa* belongs to grade I. with many spicules in each double row, while grade II. in the *florida*-group may be illustrated by *D. brevirama* (with 6—8) and *D. florida* (with 5—7). As the climax on this line of evolution, we may rank *D. pectinata* with a gigantic development of one of the two uppermost spicules in each point.

Again in the *rubra*-group, grade I. is well represented by *D. repens*, while in the *spinulosa*-group, grade II. is probably represented by *D. spinulosa* itself, with 6—8 pairs, very small and not projecting, even better by this than by *D. flabellifera* where there are 8—9, in which, however, may be recognized the beginning of differentiation: viz., a specialization of the highest pair.

In tabular form these conclusions may be represented as follows:

	I	II	III
GRADE	GLOMERATES	DIVARICATES	UMBELLATES
VI	D. *punicea* (Stud.) [1] D. carnea (Wr. & Stud.) D. doederleini Kük.	D. pütteri Kük. D. *suensoni* (Holm) D. *orientalis* Hend. D. *flammea* Sherriffs D. *cervicornis* (Wr. & Stud). D. *halterosclera* n. sp.	D. *longicaulis* Kük. D. *simplex* Sherriffs
V	. . . . .	D. eburnea Kük.	D. *coronata* (Wr. & Stud.) D. *rubescens* n. sp.
IV	D. spinifera (Holm) D. köllikeri Kük.	D. *mollis* (Holm) D. circium Kük. D. involuta Kük. D. *mirabilis* Hend.	D. *disciformis* Kük. D. rubra (May) D. *pumilio* (Studer) D. nigrescens Kük. D. *collaris* (Wr. & Stud.) D. sinensis (Püt.) D. *lutea* Kük. D. *reticulata* n. sp.
III	D. studeri (Ridley) D. *gigantea* (Verr.). D. *intermedia* n. sp.	. . . . .	D. dendrophyta (Stud.) D. *hyalina* Kük. D. mexicana Kük. D. *florida* (Esper). D. *stolonifera* (May) D. *dofleini* Kük. D. *armifer* n. sp.
II	D. mayi Kük. D. hemprichi (Klunz.)	D. *klunzingeri* (Stud.) D. *ehrenbergi* Kük. D. *japonica* Kük. D. *microspiculata* (Püt). D. erinacea Kük.	D. *brevirama* (Burch.) D. *amoebisclera* n. sp. D. spinulosa (Gray) D. *habereri* Kük. D. *annectens* Sherriffs
I	D. argentea Kük. D. clavata Kük.	. . . . .	D. villosa Kük. D. australis Kük. D. repens Kük.

1) The species printed in italics are represented in the "Siboga" collection.

The following is a convenient method of expressing the composition of the anthocodial armature: The pairs of spicules of the point are denoted by "P" if large and strong, and by "p" if small and weak; those of the pseudo-crown by "Cr"; and the supporting bundle by the letters "S. B." preceded by a qualifying adjective, such as weak, medium, very strong, etc. In this way the anthocodial grade and formula of *D. annectens*, for example, can be set forth briefly as: II. = 8 p + o Cr + very weak S. B.

TABLE OF SPECIES.

GRADE	GENUS DENDRONEPHTHYA (KÜK.)	NUMBER EXAMINED	LOCALITY, STATIONS	PREVIOUSLY RECORDED FROM
			I. GLOMERATAE.	
III	*D. gigantea* (Verr.)	18	123, 165, 213, 240, 258, 261, 303, 315	Japan, Hong Kong
III	*D. intermedia* n. sp.	4	164, 272	
VI	*D. punicea* (Stud.)	3	273 and non loc.	Japan
			II. DIVARICATAE.	
II	*D. klunzingeri* (Stud.)	2	164	Red Sea
II	*D. japonica* Kük.	3	279	Japan
II	*D. ehrenbergi* Kük.	20	164, 258, 315 and non loc.	Red Sea
II	*D. microspiculata* (Pütter)	4	99, 315	Phillipines, Hong Kong, Amboina
IV	*D. mirabilis* Hend.	4	99, 260, 282	Andamans
IV	*D. mollis* (Holm)	11	289, 301, 310b, 315, 366, and Amboina Reef and Haingsisi Reef	Japan
VI	*D. suensoni* (Holm)	2	164	Japan
VI	*D. orientalis* Hend.	4	125	Andamans
VI	*D. cervicornis* (Wr. & S.)	7	144, 305 and Kur	Lifu, Funafuti & Kei
VI	*D. halterosclera* n. sp.	2	305, 310	
VI	*D. flammea* Sherriffs	2	91	
			III. UMBELLATAE.	
II	*D. habereri* Kük.	17	49a, 133, 164, 258, 282, 310, 315	Japan.
II	*D. annectens* Sherriffs	1	not recorded	
II	*D. brevirama* (Burch.)	25	99, 164, 258	Torres Straits, China Sea
II	*D. amoebisclera* n. sp.	20	51, 302	
III	*D. florida* (Esper)	2	96, 99	Phillippines, Hong Kong, Arafura
III	*D. stolonifera* (May)	8	49a, 60	Japan [Sea
III	*D. dofleini* Kük.	1	258	Hong Kong, Malay Peninsula
III	*D. armifer* n. sp.	1	not recorded	
III	*D. hyalina* Kük.	8	257, 318, 321 and Saleyer	Pescadores
IV	*D. collaris* (Wr. & S.).	2	99	Kei
IV	*D. reticulata* n. sp.	1	79	
IV	*D. lutea* Kük.	8	not recorded	Bay of Bengal
IV	*D. disciformis* Kük.	14	99, 164, 258, 279	China Sea
IV	*D. pumilio* Stud.	11	99, 258, 274, 315	Japan
V	*D. rubescens* n. sp.	3	274	
V	*D. coronata* (Wr. & S.)	3	not recorded	Torres Straits
VI	*D. longicaulis* Kük.	1	310	Japan
VI	*D. simplex* Sherriffs	1	not recorded	
	32	213		

I. Glomeratae.

1. *Dendronephthya gigantea* (Verr.). (Plate XIX, Figs. 8 and 9; Plate XXVIII, Fig. 3).

For description see: Verrill, Bull. Mus. Comp. Zool. Cambridge, 1864, p. 40.

Stat. 123. North-bay, Biaru-island. 36—27 M. Stone and Lithothamnion-bottom. 1 Ex.
Stat. 165. Anchorage on North-east side of Daram-island (False Pisangs), East-coast of Misool. 49 M. 3 Ex.
Stat. 213. Saleyer-anchorage and surroundings, including Pulu Pasi Tanette, near the North point of Saleyer-island. Up to 36 M. Coral reefs, mud and mud with sand. 1 Ex.
Stat. 240. Banda-anchorage. 9—45 M. Black sand. Coral. Lithothamnion bank in 18—36 M. 3 Ex.
Stat. 258. Tual-anchorage, Kei-islands. 22 M. Lithothamnion; sand and coral. 1 Ex.
Stat. 261. Elat, West coast of Great-Kei-island. 27 M. Mud. 2 Ex.
Stat. 303. Haingsisi, Samau-island. Up to 36 M. Lithothamnion. 3 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 2 Ex. Unrecorded, 4 Ex.

Diagnosis: Glomerate; with numerous rounded, polyp-bearing masses, the lowest branches slightly foliaceous; polyps densely arranged in characteristic hemispherical masses; polyp stalks short, under 1 mm.; supporting bundle very strong; point spicules very variable, 1—6 pairs; no pseudo-crown; grade III.; spicules of the upper cortex are large (4 mm.), covered with blunt warts, and lie transversely; lower cortex and canal-walls have stouter and shorter spindles, triradiates and multiradiates.

Anthocodial Grade and Formula:

III. = (1—6) P + o Cr + very strong S. B.

Descriptive Notes:

Colony as a whole. Two handsome orange-coloured colonies, the largest 28 cm. wide and 20 cm. high; ten others smaller in size.

Branching. Markedly glomerate. The numerous rounded polyp-bearing, boss-like masses predominate over the stem and main branches. Therefore the colonies must be included in Kükenthal's *hemprichi*-group. The lowest branches of the colony show slight foliation.

Colouring. Generally deep orange-coloured polyps and white cortex. The specimens from Station 240, however, showed quite a different colour-scheme, viz. bright red spindles in the supporting bundle and anthocodiæ, but the general cortex greyish, with opaque, white, almost porcellanous spindles.

Polyp stalks. Short, under 1 mm.

Polyps. Densely arranged in very characteristic plump hemispherical masses of 7 or so.

Polyp spicules. The anthocodial architecture has the eight points often elongated, with the tips meeting above the polyp. Another feature is the practical absence of any true crown. Kükenthal notes in his definition of *D. gigantea* that each of the eight points has 5—6 pairs of spicules, the uppermost much larger than the others and markedly projecting. It is easy enough to find on the specimens anthocodiae which exactly correspond with this description.

Yet on the same colony may be found points with 5, 4, 3, or 2 pairs, and finally even a single pair, abutting against a few transitional small spindles leading on to the supporting bundle.

Great care was taken to avoid damaged or disturbed anthocodiae, and the Plate XIX, figs. 8 and 9 shows a series of frequently recurring types of architecture.

A general feature may be noted that in the great majority of cases the two uppermost predominate, and that when the number is reduced to 2 pairs or to 1 pair, these occupy the same space as 3—6 rows. The larger numbers 5—6 were certainly less frequent than the smaller numbers.

There is not in this case any confusion between what might be counted to points and what to crown, for in no case did we see what in other species is called a crown. It is also striking that an examination of scores of anthocodiae disclosed hardly any case of intermediate spicules between the points.

The supporting bundle is enormously developed. Its largest spicules may attain to a length of 6 mm. and project for 1.5 mm. These large spindles are densely covered with minute, blunt thorns, except for a length of 0.6 mm. at the projecting tip, which is smooth. Very marked in the large supporting-bundle spicules of the colony from Station 240 is the disappearance of the red colour from the proximal third of most of the largest. The same tendency is to be recognized in the yellow colonies.

Other spicules. The spindles of the upper cortex are often up to 4 mm. in length. They are covered with large, blunt, truncate and sometimes compound warts, and they lie transversely. Many show an abrupt narrowing at one end. In the lower cortex and canal-walls there are numerous stouter and shorter spindles, exceeding 1 mm. in length and bearing crowded, rough tubercles often compound. Large triradiates and multi-radiates also occur, besides bracket-like and quite irregular forms approaching the stellate type. A few curiously starfish-like forms occur, and triradiates with one arm exuberantly branched. Many much smaller counterparts of the large types occur. There are also occasional long, narrow spindles.

Within the *hemprichi*-group the specimens agree best with *D. gigantea*, though this may not be obvious at first sight. Many of the anthocodiae show but one pair of spicules in each point, which suggests approximation to *D. carnea*, *D. doederleini*, and *D. punicea*. From the first they are at once separated by the massive spicules, which are visible from a distance and lie in very regular transverse rows. This conflicts too seriously with the original description by WRIGHT and STUDER (p. 196), where it is said: "The stem and branches . . . . . are leathery and thickly packed with fine spicules. The latter are not recognisable by the unassisted eye and lie scattered confusedly in several layers". Both from *D. doederleini* and from *D. punicea* our specimens are sufficiently separated by the enormous strength of the supporting bundle.

Deduction: The specimens agree more closely with *D. gigantea* than with any other Glomerate known to us, and not least in showing quite an unusual degree of variability. Among the important features of agreement the following may be noted:

(1) the very characteristic plump hemispherical masses closely beset with polyps;
(2) the supporting bundle of great strength and showing many spindles of over 4 mm. (the maximum size mentioned for *D. gigantea*) and projecting for 1.5 mm.;
(3) the large spindles of the supporting bundle densely covered with minute, blunt thorns, except for the last half millimetre at the projecting tip, which is smooth;
(4) the spindles of the upper cortex frequently reach 4 mm. in length, are covered with large, blunt warts, and lie transversely;
(5) the spicules of the lower cortex and of the canal-walls;

(6) the eight anthocodial points are often elongated and have the tips meeting over the polyp; and
(7) the lowest branches of the colony show slight foliation.

The collection also includes eight other specimens (from three stations) which we refer to this species.

(1) A small flattened conglomerate colony 10 cm. high and 5 cm. across. The spicules of the general cortex are white or porcellanous in the main stem, but reddish in the smaller branches. The anterior half of the main spicule of the supporting bundle is white, while the basal portion is red. The spicules of the polyps are yellow.

Locality: Station 258.

(2) Two small upright conglomerate colonies similar in branching and size to the preceding. The general colour is orange but the tips of the spicules of the supporting bundle are white and give the colonies a very spiny appearance.

Locality: Station 315.

(3) A markedly conglomerate colony sparsely branched. The general colour is reddish orange. The main spicule of the supporting bundle is sometimes red throughout, but sometimes white in the lower half.

Locality: Station 123.

(4) Two small upright conglomerate colonies slightly more branched than those from Station 258. They are about 6 cm. high by 5 cm. in breadth. They are identical in coloration, as are also two fragments. The locality is not recorded, but it is possible that they came from the same station (258).

Previously recorded from Japan and Hong Kong.

2. *Dendronephthya intermedia* n. sp. (Plate 1, Figs. 2 and 6).

Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 M. Sand, small stones and shells. 3 Ex.
Stat. 272. Dobo, Aru-islands. 31 M. 1 Ex.

Diagnosis: Glomerate with numerous finger-like polyp-bearing lobes; polyps densely arranged in hemispherical masses; polyp stalks very short; supporting bundle strong; point spicules 4—6 pairs; no true crown; Grade III; Spicules include very thorny spindles straight and curved, short thick derivatives of the spindle type with prominences exaggerated on one side, very irregular thorny forms and occasional somewhat regular four-rayed small forms.

Anthocodial grade and formula:

$$\text{III} = 4\text{—}6\ \text{p} + \text{o}\ \text{Cr} + \text{strong S. B.}$$

Descriptive Notes:

Colony as a whole. Four colonies, the largest from Station 272 and three young colonies from Station 164.

Branching. In the largest the sterile stalk is short, but much expanded at the base. From this arise a number of stubby branches which bear the finger-like polyp-bearing lobes. The polyparium is 5 cm. wide and 2 cm. in height. The largest of the 3 young colonies is 2.5 cm. in height, of which about half is sterile (Plate 1, Fig. 2).

Colouring. In the specimen from Station 272 the coenenchyma is white but the polyps have a distinct reddish colour. Examination with a lens showed, however, that some of the

anthocodiae are yellow. In the three small colonies the general colour of the coenenchyma is whitish, the supporting bundle red and the anthocodiae canary yellow. The general appearance is red with numerous yellow blobs.

Polyp stalks. Very short.

Polyps. In clusters of from 4—10.

Polyp spicules. The anthocodial armature consists of 4—6 pairs markedly en chevron, but there is very little, if any, specialisation in the uppermost pair. There is a strong supporting bundle of 4—5 pairs of chevroned red spicules. The base of the supporting bundle fades away into the coenenchyma.

Other spicules. The spicules of the sterile stalk include (*a*) very thorny spindles, straight and curved, of many different sizes and varying greatly in degree of thorniness; (*b*) short thick derivatives of the spindle type, with prominences exaggerated on one side; (*c*) very irregular thorny forms with long thorns projecting in all directions; (*d*) occasional somewhat regular four-rayed small forms.

Deduction: This species must be referred to grade III. which includes *D. studeri* and *D. gigantea*; but it differs from any of the species described for that grade. In many respects this species agrees with *Nephthya debilis* Kükenthal, but it is undoubtedly a *Dendronephthya* since the polyps are grouped in hemispherical bundles. Thus, since we have not been able to examine KÜKENTHAL's specimen, we prefer to make a new species rather than transfer *N. debilis* to the genus *Dendronephthya*.

3. *Dendronephthya punicea* (Studer). (Plate XIX, Fig. 10).

For description see: STUDER, Ann. Mag. Nat. Hist. (6), 1888, vol. I, p. 70.

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru-islands. (Pearl-banks). 13 M. Sand and shells. 1 Ex. Unrecorded, 2 Ex.

Diagnosis: Glomerate; bundles of polyps in rounded clusters; main stem and branches little developed; polyps closely crowded, polyp stalks medium; supporting bundle strong; point spicules two only, strong and converging; pseudo-crown of about three rows of spicules irregularly disposed; grade VI.; spicules: of upper cortex, big, strong, thick spindles (2 mm.); of lower cortex, smaller and more thorny forms, including roundish and stellate types.

Anthocodial Grade and Formula:

$$VI = 2\,P + 3\,Cr + \text{strong S. B.}$$

Descriptive Notes:

Colony as a whole. A handsome Glomerate colony, with the bundles of polyps forming rounded clusters, often well separated from one another.

Branching. There is relatively little development of the main stem and main branches as compared with the stalks of the bundles of polyps composing the clusters. It is therefore one of the *hemprichi*-group.

Colouring. Branches and all spicules scarlet while the polyps themselves are pale yellow.

Polyp stalks. The polyp stalks are almost 1 mm. in length.

Polyps closely crowded.

Polyp spicules. The anthocodial armature has each point consisting of two strong, very thorny, converging spicules bent at the base in hockey-club-like fashion, one slightly larger than the other. Between adjacent points, lies a pair of much smaller, straight spindles longitudinally disposed, but in some cases there seem to be two pairs (thus connecting with *D. doederleini*). Below the points lies a pseudo-crown of horizontal spindles in two or three rows, rather irregularly disposed.

The supporting bundle is strongly developed, especially as regards the three uppermost spindles, the median one projecting for almost a millimetre.

Deduction: Among the members of the *hemprichi*-group there are several with only one pair of spicules in each of the anthocodial points, and beside these this specimen must be ranked.

It agrees very closely with *D. punicea* in the following features:

(1) each anthocodial point is composed of two spicules, one slightly larger than the other;
(2) between adjacent points there is usually a single pair of small intermediate spicules;
(3) below the main spicules of the points there are two or three rows of horizontal spindles, which form the pseudo-crown;
(4) the strong supporting bundle.

Locality: Not recorded.

There are also two other colonies which we would refer to this species:

(1) A small glomerate colony expanded horizontally with a short stem from which two main branches arise. The polyps are densely packed in hemispherical groups, giving the whole colony a squat and compact appearance. The spicules with the exception of those of the anthocodiae show a darker red than in the specimen described above.

Locality: Station 273, Jedan Isl.

(2) A small typically glomerate upright colony. The basal sterile stalk is 3.5 cm. long, while the polyparium is 3 cm. high and 2 cm. wide. The general colour is crimson red, but the main stem is whitish.

Locality: Not recorded.

Previously recorded from Japan.

II. Divaricatae.

4. *Dendronephthya klunzingeri* (Stud.). (Plate XX, Fig 3).

For description see: Studer, Ann. & Mag. Nat. Hist. (6) vol. I, 1888, p. 72.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.

Diagnosis: Divaricate; contour discontinuous; polyps 10—12 in each bundle, which resembles a close corymb; polyp stalks very short; supporting bundle strong; point spicules 8—10 close together, none projecting; no trace of even a pseudo-crown; grade II.; spicules: in the stem loosely disposed slender spindles minutely spinulose; in the cortex of the sterile stalk the spindles are more thorny and there are triradiates and quadriradiates.

Anthocodial Grade and Formula:

II. = 8—10 p + o Cr + strong S. B.

Descriptive Notes:

Colony as a whole. Contour interrupted or discontinuous. A single, young colony.

Branching. Branches of varied lengths and growing in one plane. The colony therefore ought to be referred to KÜKENTHAL's "B" section of the group Divaricatae, and certainly in the neighbourhood of *D. klunzingeri.*

Colouring. Predominantly reddish yellow in the twigs and polyp stalks, elsewhere whitish.

Polyp stalks very short.

Polyps. Each bundle of polyps is rather like a close corymb and contains 10—12 heads.

Polyp spicules. The anthocodial armature of 8—10 pairs of white spicules, closely apposed en chevron, with no more than a hint of projection, is the salient feature of the colony. Owing to their white colour these spicules stand out very conspicuously. Their surface is covered irregularly with minute tubercles, which are much more crowded towards the tips.

The supporting bundle is strongly developed, its largest spicules projecting for 0.75 mm.

Other spicules. The stem has loosely disposed spindles, tending to be slender. Many of them have only minute and rather distant spinules, while those of the surface of the sterile stalk show a development of thorns. There are, besides spindles, many irregular triradiates, quadriradiates, and brackets.

KÜKENTHAL lays stress on the great reduction of the sterile stalk. This is far from the case in this specimen, where it occupies 1.5 cm. out of a total height of 4 cm. But the proportion of stalk to polyparium in Dendronephthya is of no systematic importance.

KÜKENTHAL also notes that the outermost polyps bore markedly projecting spicules at the tips of the points. Of this feature this specimen shows no more than a trace; but the characteristic anthocodial armature is clearly that of *D. klunzingeri.*

Previously recorded from the Red Sea.

5. *Dendronephthya japonica* Kükenthal.

For description see: KÜKENTHAL, Revision der Alcyonarien, 1905, pp. 576—577.

Stat. 279. Rumah-Kuda-bay, Roma-island. 36 M. Mud and sand. 3 Ex.

Anthocodial Grade and Formula:

$$II = 6—8\ p + o\ Cr + \text{weak S. B.}$$

Three divaricate colonies with very long sterile stalks should be referred to KÜKENTHAL's *suensoni*-group. The armature of the anthocodiæ places them in SHERRIFFS' Divaricate Grade II, while the very characteristic small stellate spicules in the sterile stalk point to *D. japonica.*

The largest colony has a sterile stalk 10.5 cm. long, by 2 cm. in diameter at the base, tapering to 1 cm. at the top. Surmounting the stalk is the polyparium 7 cm. across and 5 cm. high. From the top of the stalk two very thick branches diverge at right angles, while between them there is a third thinner and shorter branch. These again are very much branched, the lower branches in all cases being foliaceous. The general outline of the polyparium is almost circular, but it is markedly flattened. The general colour is white, but the spicules of the foliaceous part are orange-yellow. On the basal 2 cm. of the sterile stalk the colour is pink.

A second colony has a stalk 9 cm. long, while the polyparium is 3 cm. high and 5.5 cm.

across. The central branch in this specimen is not so well developed as in the preceding. The colour is identical except that practically the whole of the sterile stalk is pink.

The third colony differs only in coloration. The sterile stalk is 5 cm. long. The lower part is pink but the upper a dirty white. The width of the polyparium is 5 cm. and the height 2.5 cm. There is no central branch. The spicules of the main branches are white, but some of those of the smaller branches and those of the anthocodiæ are a dark red, giving the colony a distinctly chocolate red appearance.

The supporting bundle varies in different parts of the colony. In some cases there is a very distinct bundle, but in others it is practically or entirely absent.

The double rows in the anthocodia are often very indefinite, and the number of spicules in each row varies from six to eight.

The stellate spicules of the sterile stalk are very characteristic, and agree with KÜKENTHAL's description.

Previously recorded from Japan.

6. *Dendronephthya ehrenbergi* Kük. (Plate XIX, Fig. 13).

For description see: KÜKENTHAL, Korallentiere des Roten Meeres, 1904, p. 56.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells.
Stat. 258. Tual-anchorage, Kei-islands. 22 M. Lithothamnion, sand and coral.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 3 Ex.
Stat. unrecorded. 2 Ex.

Diagnosis: Divaricate; contour irregular; polyps in little groups of 5—8; polyp stalks short; supporting bundle medium; point spicules 6 pairs; no trace of pseudo-crown; grade II; spicules: canal-walls show few bent rough spindles; the stalk cortex has very distinctive long curved spindles and irregular clubs, discs, and spheres.

Anthocodial Grade and Formula:

$$\text{II} = 6\,\text{p} + \text{o Cr} + \text{medium S. B.}$$

Descriptive Notes:

Colony as a whole. Ten specimens from Stations 164 and 258, including two fine specimens, agree closely with KÜKENTHAL's definition of this species; the largest is 40 cm. in length.

Branching. Markedly divaricate but not markedly flattened. The contour of the colony is irregular. These features point to the *suensoni*-group; and in that group the only species to which the specimens could be referred is *D. ehrenbergi*. The mode of branching is the same, and the resemblance of these specimens to KÜKENTHAL's coloured figures is striking, except that they have much less of a sterile stalk.

Colouring. Rich red in the coenenchyma and with greyish-yellow anthocodial spicules.

Polyp stalks short. Polyps arranged in little divaricate groups of about 5—8.

Polyp spicules. There are in most cases six pairs of white spicules arranged en chevron in each of the anthocodial lines: in KÜKENTHAL's forms there were 4—5 pairs. The supporting bundle consists of thick, rough, red spindles (up to 1.5 mm.) projecting freely for about 0.5 mm.

Other spicules. The canal-walls show a few bent, rough spindles. The spicules of the

stalk cortex are mostly very distinctive, long (up to 3.5 mm.), curved, red spindles, also ovals and irregular clubs covered with massive tubercles mainly with very characteristic rough blunt heads. There are also very rough discs, approaching spheres, covered with the same massive tubercles. A few triradiate forms occur in the lower cortex. There are also a few minute, colourless, irregular capstans.

Deduction: The specimens agree with *D. ehrenbergi* in having:

(1) Six pairs of spicules, in most cases, in each point of the anthocodiae;
(2) supporting bundle of rough spindles slightly projecting;
(3) the polyps in little divaricate groups of about 5—8;
(4) similar spiculation in the canal-walls; and
(5) similar mode of branching.

Localities: Stations 164, 258.

There are also two other specimens from Station 258, one from Station 164, three from Station 315, and two for which no locality is recorded.

A colony with very distinctive coloration. The general colour in some branches is pink, in others reddish. In the smaller branches, but more especially in the supporting bundle, there are spicules of a dark red colour, while the anthocodiae are yellow. Under a lens this combination of colours is very striking.

Locality: Station 258.

A small colony 4 cm. in height. The general colour is chocolate red, but the anthocodiae are yellow.

Locality: Station 258.

Another small specimen identical in branching and spiculation with those first described. The coloration is also the same.

Locality: Station 164.

Three large divaricate colonies 25 cm., 18 cm., and 10 cm. in height. They are considerably flattened and much branched. The general colour is chocolate red, but the anthocodiae are yellow.

Locality: Station 315.

A small colony considerably flattened, identical in coloration and spiculation with the first of those here described. It is slightly more rigid than the others, but this is due no doubt in great part to shrinkage.

Another colony more flaccid than the other. The general colour is pale pink with yellow anthocodiae. There is a fairly long bare stem from which two branches arise at right angles. The main stem then bifurcates. The terminal twigs are not so pointed as in the majority of the specimens, but the spiculation is identical.

Locality: Not recorded.

Previously recorded from the Red Sea.

7. *Dendronephthya microspiculata* (Pütter). (Plate XX, Fig. 4).

For description see: PÜTTER, Alcyonaceen des Breslauer Museums, Zool. Jahrb. XIII, Syst. 1900, pp. 459—460.

Stat. 99. 6°7′.5 N., 120°26′ E. 16—23 M. Lithothamnion-bottom. 1 Ex.

Stat. 315. Anchorage East of Sailus Besar. Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 2 Ex.

Diagnosis: Divaricate; firm; lowest branches slightly foliaceous; polyps in divergent groups of 4—10; polyp stalks long; supporting bundle strong; point spicules 6—8, small, close-set, the uppermost pair predominating and slightly projecting; no pseudo-crown; grade II.; spicules: in the tentacles a double row of transversely arranged, narrow, jagged spicules; in the cortex of the sterile stalk thick, bent, warty spindles and quadrangular bodies.

Anthocodial Grade and Formula:

II. = I P + 5—7 p + o Cr + strong S. B.

Descriptive Notes:

Colony as a whole. A somewhat firm young colony with a long, limp stalk; total length 5 cm., of which 1.5 is polyparium.

Branching. The lowest branches show only a hint of being foliaceous.

Colour. A fine coral-red in stalk, supporting bundle, polyp stalk, and tentacles; the general cortex of the polyparium is white flushed with red, and the anthocodial spicules are white.

Polyp stalks long.

Polyps in divergent groups of 4—10.

Polyp spicules. The armature of the anthocodiæ consists of eight points of small spicules, very compactly disposed, 6—8 en chevron in each point; the uppermost pair in each row predominate and may project slightly.

The supporting bundle is strongly developed, and one strong central spindle projects for 1 mm.; the spicules here are thickly but finely spinose.

Other spicules. The tentacles show a double dorsal row of transversely disposed, narrow, jagged, reddish spicules; the cortex of the sterile stalk has thick spindles, usually bent, covered with large warts, often compound. Along with these are smaller bent spindles, often with large prongs on the convex side. There are also numerous bright red, irregularly quadrangular or knob-like corpuscles, which may be vaguely called "stars". These are well figured by PÜTTER. All these stalk spicules with prongs are suited for interlocking.

Perhaps the most characteristic features are (1) the numerous compact chevron pairs of the anthocodial points, and (2) the quadrangular "stars".

Locality: Station 315.

Two other colonies agree in the anthocodial armature and in having quadrangular "stars" in the cortex. They differ in colour and the proportion of stalk to polyparium, but little importance can be attached to either of these points.

(1) In the first colony the stalk is 3 cm. long and the polyparium 3.5 cm. in height. The lowest branches are distinctly foliaceous and are of an orange colour. The smaller twigs are chocolate red. The spicules of the anthocodiæ are either orange or chocolate red according to their position in the colony.

Locality: Station 99.

(2) In the second colony the sterile stalk is short — less than the height of the polyparium. This specimen is distinctly suggestive of an umbellate. The spicules of the general cœnenchyma are orange; those of the supporting bundle are white or tinted with orange; those

of some of the anthocodiæ are white, of others chocolate red, and both colours may occur together.

Locality: Station 315.

Previously recorded from the Philippines, Hong Kong and Amboina.

8. *Dendronephthya mirabilis* Hend. (Plate XX, Fig. 1).

For description see: HENDERSON in Thomson and Simpson's "Alcyonarians of the Indian Ocean", Part II, 1909, pp. 49—51.

Stat. 99. 6° 7′.5 N., 120° 26′ E. 16—23 M. Lithothamnion-bottom. 1 Ex.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 M. Sand, coral and Lithothamnion. 1 Ex.

Diagnosis: Divaricate; loose; contour irregular; distinctly flattened; polyps in small bundles of about six; polyp stalks medium; supporting bundle medium; point spicules 5 pairs, with the uppermost pair slightly projecting; crown absent; grade IV; spicules: many of the stalk spicules characterised by the length and strength of their protuberances.

Anthocodial Grade and Formula:

IV. = 5 p + o Cr + medium S. B.

Descriptive Notes:

Colony as a whole. A white colony.

Branching. Loose, divaricate, with irregular contour and very distinct flattening. It should therefore be referred to KÜKENTHAL's *cervicornis*-group. Yet it agrees in several respects with HENDERSON's *D. mirabilis*, which he places in the *rigida*-group.

Colouring. Polyp stalks, spicules of the anthocodial armature and of the supporting bundle amber-yellow.

Polyp stalks not more than 1 mm. long.

Polyps occur in small bundles of about six in number.

Polyp spicules. The anthocodial armature consists of 8 double rows of about five pairs, converging steeply, and with the uppermost pair slightly projecting, which, we must admit, does not agree very well with HENDERSON's description and figure. The supporting bundle is moderately developed and has about 3 projecting spindles, one of them slightly longer than the others. The projecting portion is about a third of a millimetre in length.

Other spicules. Our chief reason for referring this specimen to HENDERSON's *D. mirabilis* is the almost unique appearance of many of the stalk spicules. They are spindles straight and curved, spindles approaching clubs and very rough at the broad end, irregular bodies and many quadriradiates, all marked by the length and strength of their spines and protuberances, which are sometimes compound and often tuberculate. Some of the curved spindles have these prominent processes especially strong about the middle, while others are very markedly unilateral, with a few tubercles on one side and a great array of long, often divaricate processes on the other. These unilateral processes are strongest at one end of the spicule and wane towards the other. Among the extraordinary forms, which present an appearance unusual in the genus, there are commonplace straight spindles with small regular spines and tubercles.

Locality: Station 282.

Another colony from Station 99 must be referred to this species. In its anthocodial armature, spiculation and colour, it is identical.

Locality: Station 99.

A small divaricate flattened colony agrees with the two specimens described above, except in colour. The anthocodial armature is identical, as also are the spicules of the sterile stalk. The general colour is white, but the stalks of the polyps pass from white to red; the terminal half of the supporting bundle is reddish, and the spicules of the anthocodiæ are bright red.

Locality: Station 260.

Previously recorded from the Andamans.

9. *Dendronephthya mollis* (Holm). (Plate XIX, Fig. 12).

For description see: HOLM, Zool. Jahrb. VIII, Syst. 1895, pp. 51—53.

Stat. 60. Haingsisi. Reef. 2 Ex.
Stat. 231. Amboina. Reef. 4 Ex.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 1 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 22 M. Mud, coral and Lithothamnion. 1 Ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 2 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 2 Ex.
Bay of Batavia, Java, SLUITER leg. 1 Ex.

Diagnosis: Divaricate; contour regular; not flattened or only slightly; polyps in groups of about 10; polyp stalks medium; supporting bundle very strong; point spicules 4 pairs with the uppermost pair (or one of that pair only) strong and projecting; grade IV; spicules: stalk has rough spindles, triradiates and quadriradiates.

Anthocodial Grade and Formula:

$$IV = 1—2\ P + 3\ p + 0\ Cr + \text{very strong S. B.}$$

Descriptive Notes:

Colony as a whole. Four whitish colonies, two of them young or fragmentary.

Branching. Divaricate, of regular outline, not flattened. Should be referred to KÜKENTHAL's *divaricata*-group, within which they approach *D. mollis*.

Colouring. General surface white, anthocodial armature and supporting bundles reddish brown in the largest specimen. In the two younger colonies the anthocodial and supporting-bundle spicules are amber-yellow. The fourth colony is ivory-white.

Polyp stalks about 1 mm. long.

Polyps arranged in groups of about ten in number.

Polyp spicules. One of the uppermost pair of spicules in at least some of the eight points is strong, out of proportion to the others and projects very markedly beyond the polyp. The other spindles of the points are small and converging, and there may be four pairs of them. In many cases the large projecting spindle has fallen off, and its attachment seems to be very loose.

The supporting bundle is very strongly developed and 3 or so of its component spicules project beyond the polyp for over 1 mm. The spindles are densely and regularly covered with very small blunt tubercles, while here and there almost smooth forms occur.

Other spicules. Those of the short stalk include, besides spindles much rougher than those of the anthocodiæ and more curved, various triradiate and smaller irregular quadriradiate forms.

Locality: Amboina Reef.

The two young divaricate colonies with amber-yellow anthocodial and supporting-bundle spicules have distinct flattening, and show what we regard as essential characteristics of *D. mollis* viz.:

(1) a very marked projection of one of the uppermost spicules of each point in the anthocodial armature;

(2) the presence of 3 or 4 other pairs of smaller spicules converging en chevron;

(3) the very strong supporting bundle with three specially strong spicules, one of which projects beyond the others for about one millimetre;

(4) the dense regular covering of the anthocodial, supporting-bundle, and cœnenchyma spicules with short blunt tubercles;

(5) the prevalence on the short stalk of much rougher spindles (straight, curved, and much curved), with much longer and more distant tubercles, and along with these numerous, irregularly shaped, roughly tuberculate forms.

A few spindles occur with asymmetrical, bifid ends. The polyp stalks are longer than in the other forms.

Locality: Station 310.

The fragmentary, ivory-white colony, without a stalk, divaricate in type, in its branches inclined to be flattened, closely approaches *D. mollis* in showing:

(1) a very marked projection of one of the uppermost spicules of each point;

(2) the others (usually 3 pairs) much smaller;

(3) a very strong supporting bundle with three specially strong spicules, one of which projects for at least 1 mm.;

(4) the dense regular covering of the spicules with short, blunt tubercles.

Most of the spicules are curved spindles, many boomerang-like; bifid and trifid forms occasionally occur; here and there one is almost quite smooth.

Locality: Bay of Batavia, Java.

In the collection there are seven other specimens which must be referred to this species:

(1) A small colony flattened horizontally so that the outline is almost circular. Here is no trace of attachment. The under view shows four very much flattened bare branches, arising at right angles, three almost equal in size and one slightly smaller. These branches give rise to smaller branches and these again to others, which bear the bundles of polyps. On the upper side branches arise all over and give the appearance of a network. The general coloration is a dull white with orange polyps.

Locality: Station 289.

(2) Two colonies each with a moderately long stalk. The polyparium is slightly flattened. The stalk of the larger specimen is 3.5 cm. long, and the polyparium is 3.5 cm. high and 3.5 cm. across. In the smaller specimen the stalk is 3.5 cm. long and the polyparium 2.5 cm. by 2.5 cm. These specimens agree in detail with the amber yellow colonies described above from Amboina reef.

Locality: Station 315.

(3) Two fragments of a young pure-white specimen identical with those described above from Station 366.

Locality: Station 301.

(4) Two other fragments very similar to the above.

Locality: Haingsisi Reef.

It should be noted that although all these specimens agree in most respects with HOLM's description, the internal canal walls contain spindles.

Deduction: It appears to us that the most striking feature of this species is the exaggeration of one of the terminal spicules of certain anthocodial rows, but it must be admitted that many of the heads show no trace of this.

Previously recorded from Japan.

10. *Dendronephthya suensoni* (Holm). (Plate XIX, Fig. 11).

For description see: HOLM, Zool. Jahrb. VIII. Syst., 1895, pp. 35—37.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 2 Ex.

Diagnosis: Divaricate; outline irregular; not obviously flattened; polyps in little groups (4—10), distinctly scattered, polyp stalks medium; supporting bundle medium; point spicules one pair only, of which one is a long projecting curved spindle associated with a much smaller one at its base; pseudo-crown of some six rows of horizontally disposed spindles; grade VI.; spicules: canal-walls show numerous forms with greatly developed thorns.

Anthocodial Grade and Formula:

$$VI = I + 1\ P + 4\text{—}6\ Cr + \text{medium S. B.}$$

Descriptive Notes:

Colony as a whole. Two handsome colonies agreeing very well with HOLM's figures.

Branching. Markedly divaricate, of irregular outline, not obviously flattened, referable to KÜKENTHAL's *suensoni*-group.

Colouring. Deep rose-red spicules on cortex and polyps; the polyps themselves, apart from their spicules, are yellowish grey.

Polyp stalks about 1.3 mm. long.

Polyps in little groups (4—10) distinctly scattered.

Polyp spicules. Anthocodiæ show eight points, each consisting of a long, projecting curved spindle with a much smaller one at its base, the two being obviously members of a pair. These points rise from a pseudo-crown of about 6 rows of horizontally disposed curved spindles. The supporting bundle consists of only three strong spindles up to 3 mm. long, one of which projects for only a short distance.

Other spicules. The canal-walls contain numerous forms with conspicuously developed thorns.

Previously recorded from Japan.

11. *Dendronephthya orientalis* Hend. (Plate XX, Fig. 5).

For description see: HENDERSON in Thomson and Simpson's Alcyonarians of the Indian Ocean, Part II, 1909, pp. 30—32.

Stat. 125. Anchorage off Sawan, Siau-island. 27 M. Stone and some Lithothamnion. 1 Ex.

Diagnosis: Divaricate; no regular outline; somewhat flattened; polyps in loose clusters; polyp stalks long; supporting bundle strong; point spicules one pair only, of which one member is the larger and markedly projects; pseudo-crown of three loose horizontal rows; grade VI.; spicules: tentacles conspicuously armoured; in the cortex very conspicuous strong spindles and numerous small warty triradiates and multiradiates.

Anthocodial Grade and Formula:

VI. = 1 P + 3 Cr + strong S. B.

Descriptive Notes:

Colony as a whole. Without regular outline; somewhat flattened; with loose clusters of polyps; agrees generally with HENDERSON's description. Four colonies in all.

Branching. Short, but divaricate.

Colour. General surface white, with the spicules of the anthocodiæ and supporting bundles coral-pink.

Polyp stalks. Long.

Polyps in loose clusters of six or so.

Polyp spicules. The eight anthocodial points consist of two curved spindles, one always larger than the other and projecting markedly beyond the polyp. The pseudo-crown shows 3 rather loose horizontal rows, while below these and projecting outwards there are several spindles which merge gradually into those of the polyp stalk.

The supporting bundle is strongly developed, and consists of one very predominant spindle based in numerous small ones.

Other spicules. On the aboral surface of the tentacles the armature is very conspicuous. Very characteristic in the cortex among the strong spindles are numerous small, irregular, warty spicules, often triradiate or with irregular rays in different directions. Among them are minute warty capstans like those figured by HENDERSON for the canal-walls.

Previously recorded from the Andamans.

12. *Dendronephthya cervicornis* (Wr. and St.) (Plate XIX, Fig. 14).

For description see: WRIGHT and STUDER, Rep. Sc. Res. "Challenger", 1889, vol. XXXI, pp. 220—221.

Stat. 144. Anchorage north of Salomakiëe-(Damar-)island. 45 M. Coral.
Stat. 250. Kur-island. 20—45 M. Coral and Lithothamnion. 4 Ex.
Stat. 305. Mid-channel in Solor-strait off Kampong Menanga. 113 M. Stony. 1 Ex.

Anthocodial Grade and Formula:

VI = 2 P + 4—5 Cr + strong S. B.

There are in the collection four specimens which agree very closely both in anthocodial spiculation and in the spicules of the sterile stalk with those described by WRIGHT and STUDER. The longest is 7 cm. in height, of which 4.5 cm. is sterile stalk. The diameter of the stalk at the base is 1 cm. The top of the stalk is encircled by a foliaceous collar. Above this the colony is branched. The general colour is chocolate red, but the polyps are yellow. In the foliaceous collar the spicules of the anthocodia are yellow.

Locality: Kur, 15 fathoms.

The three other colonies are 3.5 cm., 3 cm., and 3 cm., in height. The sterile stalk is not so long and the coloration is different, otherwise they are identical with the preceding. The general colour of the cœnenchyma is white, but the spicules of the smaller branches and those of the anthocodiæ are orange yellow.

Localities: Station 305. Solor Str. and Station 144.

Previously recorded from Lifu, Funafuti and Kei.

13. *Dendronephthya halterosclera* n. sp. (Plate I, Fig. 1; Plate XXVI, Fig. 3).

Described as *Dendronephthya cervicornis* by SHERRIFFS.

Stat. 305. Mid-channel in Solor-strait off Kampong Menanga. 113 M. Stony. 1 Ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.

Diagnosis: Divaricate; rigid; outline irregular; distinctly flattened; polyps loosely spaced; polyp stalks long; supporting bundle very strong; point spicules one pair only, with one member stronger than the other and projecting somewhat; pseudo-crown of about 5 rows closely packed together; grade VI; spicules: small dumb-bells; very tuberculate small spindles; pseudo-clubs and large warty spindles.

Anthocodial Grade and Formula:

$$VI = 2\ P + 4—5\ Cr + \text{strong S. B.}$$

Descriptive Notes:

Colony as a whole. Two approximately rigid, bright orange, young colonies.

Branching. Markedly divaricate; outline irregular and flattened.

Colouring. Bright orange as a whole.

Polyp stalks long. Polyps divergent and loosely spaced.

Polyp spicules. The anthocodial armature shows 4—5 horizontal spindles closely packed in a pseudo-crown and a pair of converging spindles in each of the eight points, one member of the pair often larger than the other and projecting a little beyond the polyp. The supporting bundle is very strong, and one of its spindles may attain a length of 3 mm.

Other spicules. The spicules of the sterile stalk are very characteristic. They consist of (*a*) small dumb-bells; (as the knobs of these dumb-bells increase in size the constriction disappears and the resulting spicule is a somewhat globular very knobby form): (*b*) small very tuberculate spindles which lead to (*c*) pseudo-clubs. There are also large warty spindles, relatively few in number.

Deduction: In general branching and in anthocodial armature these specimens approach *D. cervicornis*, but the spicules of the sterile stalk are so different and distinctive that we are compelled to establish a new species.

14. *Dendronephthya flammea* Sherriffs. (Plate XX, Fig. 2).

Stat. 91. Muaras-reef, inner side: East coast of Borneo.
Karang Lintang and Pulu Palabangan Island. Up to 54 M. Hard coral sand. Coral at anchorage. Lithothamnion near the islands. 2 Ex.

Diagnosis: Divaricate: outline quite irregular; markedly flattened; lower branches somewhat foliaceous; polyps in small bundles of 3—6, but many isolated polyps occur; polyp stalks

very short; supporting bundle strong; point spicules one strong pair; pseudo-crown of 3—4 rows of straight rough spindles; grade VI.; spicules: sterile stalk has large rough yellowish spindles along with small red interlocking forms; no spicules found in the canal-walls.

Anthocodial Grade and Formula:

$$VI = 2\,P + 3\text{—}4\,Cr + \text{strong S. B.}$$

Descriptive Notes:

Colony as a whole. Two colonies, the larger 17 cm. in height, including the 3.5 cm. sterile stalk, by 10 cm. in breadth.

Branching. Divaricate, quite irregular in contour, markedly flattened. The lower branches are somewhat foliaceous, but do not form a collar. It ought to be referred to the *cervicornis*-group of KÜKENTHAL's Divaricatæ, and to the subdivision with short polyp stalks; but it does not agree with any of the three species there included, nor with any other Divaricate approaching this group. Each of the half-dozen main branches ramifies irregularly in a flabellate fashion, but there tends to be a predominance of secondary branches to one side. The surface is richly beset with small, almost sessile bundles of polyps, which also occur all over the cortex. These small bundles may, of course, be young stages of twigs.

Colouring. Predominantly of a brilliant red. The cortex is vividly coloured except at the beginning of the polyparium, where it is almost white. On the branches and twigs all the spicules are deep red.

Polyp stalks very short. A somewhat marked feature is the small number (3—6) of polyps in each bundle and the frequency of isolated single polyps.

Polyp spicules. The anthocodial armature consists of eight strong points, each composed of two rough hockey-club spicules rising from a strongly-developed pseudo-crown of 3—4 practically horizontal rough spindles. In many cases the non-retracted state of the polyp brings the pseudo-crown spicules into a chevron arrangement in line with the uppermost pair. Between every two points there are usually two intermediates. On the whole the anthocodial armature is nearest that of *D. circium*. The anthocodial spicules are almost white, but show a faint yellowish tinge. They are characteristically rough, with relatively large, very blunt tubercles, not densely crowded.

The supporting bundle is well developed and inclined to be of the sheath type, showing 3 spindles much larger than the rest — that is to say, a median and two laterals, abutted by numerous smaller ones, which show a tendency to be in parallel lines sloping towards the main spicules. The median spindle usually projects for about 0.5 mm., and the two laterals sometimes project a very little. The supporting sheath spicules are often curved and are densely covered with short, rounded tubercles.

Other spicules. On the sterile stalk are large, broad, rough, yellowish spindles, connected by small interlocking irregular reddish forms; which produce an arenaceous appearance. The cortex here bears a variety of spicules, all thickly covered with rather massive, blunt, rough tubercles, sometimes compound and well suited for interlocking. They include the following forms: (*a*) long stout spindles, slightly curved; (*b*) spindles expanding at one end in a pseudo-club fashion; (*c*) a few large triradiates; (*d*) numerous irregular triradiates; (*e*) smaller triradiates with a rough boss rising at right angles to the rays; (*f*) long-armed quadriradiates; (*g*) knobbed spherical "astroscleres".

The spicules of the cortex in general are spindles densely covered with relatively large, rough-tipped, rounded tubercles. Especially on the shorter spindles do these tubercles stand out to a notable height like mammillæ, projecting to about one-fifth of the breadth of the spindle.

On the branches and twigs all the spicules are deep red, and there are numerous large spindles which tend to project on the surface in jagged fashion, and are on the whole transversely disposed.

No spicules were found in the canal-walls.

The following measurements were taken:

(*a*) Supporting-bundle spicules . . . . . Up to 2 mm.
(*b*) General upper-cortex spicules . . . . . Up to 4 mm.
(*c*) Largest spindles of the cortex of the sterile stalk . . Up to 2 mm.

III. Umbellatae.

15. *Dendronephthya habereri* Kük. (Plate XX, Fig. 9; Plate XXVI, Fig. 4).

For description see: Kükenthal, Versuch einer Revision der Alcyonarien, II, 1905, pp. 638–641.

Stat. 49. 8° 20′.5 S., 119′ 4′.5 E. 369 M. Coral and shells. 1 Ex.
Stat. 133. Anchorage off Lirung, Salibabu-island. Up to 36 M. Mud and hard sand. 2 Ex.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.
Stat. 258. Tual-anchorage, Kei-islands. 22 M. Lithothamnion, sand and coral. 1 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 M. Sand, coral and Lithothamnion. 1 Ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand, with few pieces of dead coral. 1 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 2 Ex.
Station unrecorded. 8 Ex.

Anthocodial Grade and Formula:

$$\text{III} = 5\text{—}6\ \text{p} + \text{o}\ \text{Cr} + \text{strong}\ \text{S. B.}$$

A re-examination of the specimens which Sherriffs referred to this species and also of those he referred to *D. brevirama* and *D. disciformis*, has caused us to modify the conclusion at which he arrived, and to transfer some of his specimens to other species. For example, 3 specimens he referred to *D. brevirama* and two he referred to *D. disciformis* we now place in *D. habereri*, while for one specimen he placed in *D. brevirama* we have established a new species, *D. armifer*.

We have also examined seven other specimens which we refer to *D. habereri*.

Each specimen is here described separately, so that there should be no confusion. In all there are 17 specimens from 7 localities.

As Kükenthal has pointed out, there is considerable variability in *D. habereri*; and instead of multiplying species we prefer to note that this species has a somewhat elastic range of minute features. For example: (1) Some of the colonies are very compact and stiff, and the grouping of the umbels in hemispherical masses is so close together that an almost uniform surface results. In others the polyp-bearing branches are much more divergent and this gives the impression of an "open", and not a compact colony. (2) Although as a rule the polyp stalks might be described as short, in some specimens they may exceed 1 mm.; and it should be noted that both types may be found on one colony. (3) The number of pairs of spicules

in the anthocodial points shows great variability. In some colonies five pairs is the predominant number, while four or six also occur; we found as few as four and as many as seven in one colony. After examining a very large number, we place the average at 5—6 pairs. Sometimes the en chevron rows are very regular, but on the other hand they may be very irregular, as figured by KÜKENTHAL. (4) In certain cases, though not in the majority, the uppermost pair is distinctly longer and stronger than the others. (5) In some specimens the supporting bundle is of the ensheathing type, as figured by KÜKENTHAL, but in others one of the spicules is considerably longer than the others and projects. (6) In some of the specimens, exceedingly characteristic is the heavy armature of the tentacles. It should be noted further that when the tentacles are fully expanded the arrangement of the spicules is in a double longitudinal row, and in our judgment it seems a mistake to attach importance to transverse or longitudinal arrangement.

Very characteristic, however, of all the specimens is the nature of the spicules of the lower cortex. These consist of (1) long and short, massive, blunt, very tuberculate spindles. These are covered with compound warts and it is difficult to exaggerate the spinosity of some of the warts, which bear secondary and tertiary branches, sometimes almost antler-like. (2) Spiny spindles, from which are derived triradiates and quadriradiates. (3) Minute smooth capstans which by connecting stages develop into large massive rough irregulars.

Of special interest is the variety of colour schemes in this species. These are referred to individually in the description of the different specimens:

(*a*) A compact stiff colony with a sterile stalk 2.5 cm. long and about the same in diameter. There are numerous stolons to which sand and shells adhere. The polyparium is considerably flattened. The general colour is chocolate brown, but the polyps are yellow.

Locality: Station 315.

(*b*) A complete stiff colony with a short basal stalk, from the periphery of which a mass of stolons arise. Many of these are considerably branched and have sand and shells embedded in them. Some of them are 10 cm. long. There is no hint of attachment and the colony must have been fixed in a bottom of sand and shells by means of the stolons. The colony is considerably flattened in one plane. The sterile stalk is chocolate red; the base of the polyparium is orange, and this colour extends irregularly up the flattened sides; the margins and the top of the polyparium are chocolate. The polyps are of a yellow colour throughout.

Locality: Station 315.

(*c*) A beautiful compact stiff colony, considerably flattened. The flattened sides are chocolate brown, while the edges are orange. In all cases the polyps are yellow. (Four pairs is the commonest number in the points of the anthocodiæ.)

The colour scheme in these three specimens is remarkable on account of its distribution on the colonies: in (*a*) chocolate brown throughout; in (*b*) chocolate brown on edges and orange on sides; in (*c*) chocolate brown on sides and orange on edges.

(*d*) Very similar to the preceding three specimens is a broken portion of what was evidently a large colony, compact and brittle. Some of the branches are chocolate red, others are orange, but in all cases the polyps are yellow.

In this specimen, exceedingly characteristic is the heavy armature of the tentacles.

Station 310.

(*e*) Another colony with a sterile stalk 3.5 cm. long and 1.5 cm. in diameter. The polyparium is stiff but not so compact as some of the others. The general colour is pale orange with white polyps.
(*f*) Another colony, very loose and open. The lower branches are distinctly foliaceous. The general colour is a yellowish orange, but the smaller branches and polyps in the marginal portion are pinkish and red.

Station 164.

(*g*) A beautiful colony with a sterile stalk 2.5 cm. in length. The polyparium is 6 cm. in height and 3 cm. in breadth. It is distinctly flattened in one plane, and the whole colony might be described as "open". The colour of the stem and branches is white, but the polyps are a reddish orange.

Station 49[a].

(*h*) A massive almost globular colony with a very stout sterile stalk of a reddish pink colour. The general appearance of the colony is pinkish, due to the coloration of the spicules in the smaller twigs and also those of the supporting bundle.

Station 282 near Timor.

(*i*) A colony very similar to the last but with a very short stalk, and not so compact. The coloration is identical.

Locality: Not recorded.

(*j*) Two large colonies. In the first the sterile stalk is 7 cm. in length and 4.5 cm. in breadth. The polyparium is 11 cm. high and 10 cm. broad. In the second the corresponding measurements are 4 cm., 4 cm.; 12 cm. and 10 cm. The general branching is loose and the colonies might be described as very "open": not in any sense compact. The stem and main branches are white, but the smaller twigs are reddish. The anthocodiæ are white.

Locality: Not recorded.

(*k*) Another "open" colony, creamy white in general appearance but with pinkish points to the projecting supporting bundle spicules.

Locality: Station 258.

(*l*) Another small colony very similar to the preceding.

Locality: Not recorded.

(*m*) Two "open" colonies very similar in general appearance. In the first, however, the smaller twigs are pink, while the anthocodiæ are white. In the second the anthocodial armature is pink.

Locality: Not recorded.

(*n*) Two small colonies from Station 133. In the first there is a long sterile stalk from which arise two main branches; in the other the polyparium is single and spheroidal. The general colour in both is chocolate red. (In no case could we find more than four pairs in the points of the anthocodiæ).

Locality: Station 133. Previously recorded from Japan.

16. *Dendronephthya annectens* Sherriffs. (Plate XX, Fig 13 and 14; Plate XXVIII, Fig. 2).

Station unrecorded. 1 Ex.

Diagnosis: Umbellate; much branched, but with few large branches; distinctly flattened; contour not uniform; basal branches foliaceous; polyps in small bundles of 7—12; polyp stalks

very short; supporting bundle very weak; point spicules about 8 pairs, equal in size; crown absent; grade II; spicules: short sterile stalk has irregularly branched, almost stellate, sclerites; spindles of the branches often very large (6 mm.); colourless spindles in the general cortex and stars at the base.

Anthocodial Grade and Formula:

II = 8 p + o Cr + very weak S. B.

Descriptive Notes:

Colony as a whole. Very handsome umbellate colony with profuse root-work; hardly visible sterile stalk; a much branched and, in its general aspect, distinctly flattened polyparium. It is 32 cm. in maximum height and 40 cm. in maximum breadth, with an approximate thickness of 6 cm. The contour of the whole colony is markedly interrupted.

Branching. There is a general division into three strong branches each of which tends to lose the flattened aspect, broadening out into an exuberant corymbose head. The polyp-bearing twigs are distinct umbels. There are no definite large hemispherical bunches. Large areas on the branches are bare and exposed. The basal branches are foliaceous, but do not form a complete circle. The main branches give off numerous secondary and tertiary branches, which eventually break up, with fairly regular dichotomy, into minor corymbs, bringing the crowded polyps more or less up to one level.

Colouring. The exposed areas on the branches are covered with irregularly scattered spindles, visible to the naked eye and giving the surface a glistening white appearance. On the twigs are large orange and crimson spindles, standing out conspicuously against the general white of the cortex. There seems to be no regularity in the distribution of the two colours, except that any one group of twigs is either orange or crimson. The supporting bundles are also either orange or crimson, but the polyp spicules are white.

Polyps stalks are very short. The polyps themselves occur in small bundles of 7—12, and the stalk of each bundle is long. The anthocodial armature consists of about 8 pairs of spicules en chevron on each of the eight points, all practically of the same size, about 0.13 mm. Below the point there is no true crown, but there are small white spindles on the soft polyp stalk, lying irregularly but on the whole transversely and quite distinct from the coloured spindles of the supporting sheath which lie longitudinally. It is plain that the uppermost rows of these transverse spindles might furnish the raw materials of a crown.

The supporting bundle is of the ensheathing type and is often very inconspicuous. The typical form is a curved triangle around the polyp stalk, composed altogether of about a dozen spicules, and those composing the tip are not conspicuously longer than the rest. It is what might be called a slightly differentiated supporting sheath rather than a supporting bundle, and its comparatively small spindles must not be mixed up with the large supports of the common stalk of the bundle. The supporting bundle only occasionally projects a little beyond the polyp. Its component spicules do not attain a length of more than 0.75 mm.

Other spicules. Very noteworthy is the spiculation of the short, sterile stalk, where for a very limited area the spindles are replaced by irregularly branched, almost stellate, sclerites, which interlock and give the surface an arenaceous appearance. Many of the branchlet spindles are striking in their size, reaching a length of 6 mm. They are densely covered with truncated

columnar tubercles which form regular curved transverse rows, recalling the septa of an elongated Fungia coral. The truncated tops are very rough and sometimes compound.

The colourless spindles of the general cortex are partly like small editions of those just mentioned, and partly narrower forms with distant and relatively few tubercles. They range from 1—2.5 mm. in length. The small "stellate" forms at the base are very irregular in shape. Many are almost globular; many are minute quadriradiates; many show one predominant boss among the radiating knobs; while many again correspond exactly with those figured by KÜKENTHAL for *D. japonica*.

Very few canal-wall spicules could be found. Those that occurred were narrow rodlets with a few distinct tubercles.

Deduction: Although this splendid specimen has no uniform contour it presents many resemblances to *D. brevirama* (Burch.), such as:

(1) the anthocodial armature of 6—8 spicules in each point, the uppermost not projecting;
(2) the short polyp stalk;
(3) the numerous 2 mm. spindles of the general cortex;
(4) the crowded stellate bodies of the lower cortex; and
(5) in the polyp-bearing twigs a corymbose-dichotomous branching, almost identical with that of specimens which agree in detail with *D. brevirama*.

Yet this specimen differs markedly from *D. brevirama* in the following respects:

(*a*) it has a different type of supporting bundle, namely a sheath, instead of a buttress with a markedly predominating needle;
(*b*) it has practically no spicules in the canal-walls; and (*c*) it has not more than a hint of triradiates.

It therefore seems best to establish a new species, closely like *D. brevirama* (an Umbellate) in some respects and very like *D. japonica* (a Divaricate!) in others.

17. *Dendronephthya brevirama* (Burch.). (Plate XX, Fig. 12).

For description see: BURCHARDT, Alcyonaceen von Thursday-Island und von Amboina; Semon, Forschungsreisen, V. 5; 1898, pp. 438—439.

Stat. 99. 6° 7′.5 N., 120° 26′ E. 16—23 M. Lithothamnion-bottom. 1 Ex.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.
Stat. 258. Tual-anchorage, Kei-islands. 22 M. Lithothamnion; sand and coral. 15 Ex.
Station unrecorded. 10 Ex.

Diagnosis: Umbellate; umbels not combining in hemispherical masses; contour almost continuous; flattened in one plane; surface of the individual umbels varies from convex to concave; lowest branches slightly foliaceous and forming an interrupted collar; polyps in small bundles; polyp stalks short; supporting bundle strong; point spicules 6—8 converging pairs of small spicules, none projecting; grade II; spicules: cortex of branches shows long spinulose spindles, cortex of stalk has coarsely tuberculate broad spindles, triradiates, and irregular discs.

Anthocodial Grade and Formula:

$$\text{II} = 6\text{—}8\ \text{p} + \text{o}\ \text{Cr} + \text{strong S. B.}$$

Descriptive Notes:

Colony as a whole. Six colonies, of which the largest is 19 cm. in height by 13 cm. in width. The umbels do not combine in hemispherical masses; the contour of the polyparium is almost continuous; there is a considerable flattening in one plane; the surface of the individual umbels varies from convex to concave — a feature to which we cannot attach importance. The specimen should be referred to KÜKENTHAL's *florida*-group and therein to the species *D. brevirama*.

Branching. The lowest branches are slightly foliaceous, and form an interrupted collar.

Colouring. The general surface is yellow-white, the polyps yellow, the branches showing strong purplish spiculation.

Polyp stalks are short, a little less than 1 mm. Polyps in small bundles. The anthocodial armature of 8 points shows 6—8 converging pairs of small spicules, none projecting.

The supporting bundle has one strong predominating spindle up to 3 mm. in length, projecting for about 0.75 mm.

Other spicules. The cortex of the branches shows numerous long, straight, or curved bright red spindles, covered with short, rather delicate, sharply conical spinules, particularly crowded at the ends. The cortex of the stalk region shows (*a*) numerous coarsely tuberculate broad spindles, straight or curved; (*b*) asymmetrical bent spindles, with the tubercles stronger on the convex side; (*c*) spindles with one end broadened out; (*d*) irregular tuberculate discs, some almost spherical, others almost stellate; (*e*) regular and irregular triradiates (some very massive).

The canal-walls in the stalk region show numerous strong triradiates and curiously irregular quadriradiates, all roughly tuberculated, while besides these are minute irregularly radiate forms inclining to be smooth.

Locality: Station not recorded.

A much smaller younger colony, with a polyparium 4 cm. by 4.6 cm., is worthy of notice because of certain slight divergences. The umbellate character of the twigs is much less pronounced, the whole branching is looser, the uppermost pair of spindles in each point sometimes project to a very slight extent. The specimen suggests that young stages of members of the Umbellatæ may be somewhat divaricate in their general mode of branching.

On the other hand, the collection includes another colony, with polyparium 4.7 cm. by 4.7 cm. in maximum height and breadth, which is interesting in showing the very opposite vegetative characters; for it is markedly umbellate in the branching of the twigs and extremely dense in the general branching, so presenting a uniform compact surface. Yet the spiculation and the anthocodial armature are identical with those above described. In the recesses of the polyparium there lay a large Ophiuroid.

Locality: Station 164.

Still another colony, at first sight divergent, agrees so thoroughly in anthocodial architecture and spiculation that separation appears to us impossible. The somewhat looser umbels show a marked tendency to grouping in hemispherical bunches, especially on one side of the colony; the contour is somewhat broken up; the lowest branches are slightly foliaceous; the sterile stalk has been broken off, leaving only a short stump; the general colouring is yellow-white, with white spindles in the polyps and faint rose tips to many of the supporting bundles.

Yet an examination of the anthocodiæ shows the characteristic composition of the points, about 7 pairs of converging spicules, of which the uppermost pair may be slightly larger but do not project. Again, the lower cortex contains massive spindles with high compound warts, a few massive triradiates, many rough spindles curved at one end, many pseudo-clubs, and very numerous small knobbed and bossed forms like astrospheres. In the canal-walls there are some rough sclerites, but also a number of almost smooth, delicate, flat triradiate, quadriradiate, and approximately star-like forms.

Deduction: We have here another illustration of the inadvisability of attaching much importance to the vegetative characters.

In anthocodial architecture this species comes near *D. florida*, but the shortness of the polyp stalks is too emphatic to be neglected.

Locality: Station 258.

The collection also includes nineteen other specimens, fourteen from Station 258, one from Station 99, and four from an unrecorded locality. These form an extremely interesting series as they show all the vegetative vagaries described above. They might all be termed "open" colonies with the exception of one which is decidedly compact. The bundles of polyps are, however, very characteristic and the spiculation is identical with that described for *D. brevirama*.

Their chief interest lies, however, in the diversity of colouring.

In one specimen, that from Station 99, the foliaceous parts at the base of the colony, and some of the twigs, are bright red, while the remainder of the colony is pure white. In another colony (locality unknown) the stalk is pinkish, but the whole of the polyparium is white. To the naked eye several of the colonies are pure white, but under a lens the tips of some of the spicules of the supporting bundle are seen to be pink.

One large colony has a distinctly reddish appearance. On examination with a lens, however, it is noted that only the spicules of the supporting bundle are pink or bright red, yet the general effect is as stated.

The colour scheme and general effect is decided, however, not only by the spicules of the supporting bundle, but also by the spicules of the coenenchyma of the smaller branches. The various grades may be summarised thus. The whole of the spicules may be white, the tips of the spicules of the supporting bundle may be pink or even red, the whole of the spicules of the supporting bundle may be pink or red. In addition to this, there may be a faint pinkish coloration of the spicules of the coenenchyma of the branches, leading to a distinct pink or even a red. The general impression of the first type is white, passing through pink to a decided red. In all cases the anthocodiæ are white.

Previously recorded from Torres Straits and China Sea.

18. *Dendronephthya amoebisclera* n. sp. (Plate I, Figs. 3 and 5; Plate XXI, Fig. 7; Plate XXVIII, fig. 1).

Described as *Dendronephthya clavata* Kük. by Sherriffs, Evolution within the genus Dendronephthya. (Plate I and Textfig. 7).

Stat. 51. Madura-bay and other localities in the southern part of Molo-strait. 69—94 M. Fine grey sand; coarse sand with shells and stones. 10 Ex.

Stat. 302. 10° 27′.9 S., 123° 28′.7 E. 216 M. Sand and coral sand. 17 Ex.

Sherriffs refers ten specimens to the Section Glomeratae and the species *clavata* (Kükenthal), but a re-examination of them and a number of others in the collection has led us to the conclusion that, although they agree with Kükenthal's description to a certain extent, they are really Umbellate and belong to the *spinulosa*-group. There are marked differences from the species described in that group which justify us in making a new species. For example, (1) the polyp stalk is much longer, (2) the supporting bundle is much less strongly developed, (3) the points consist of about six and certainly never more than eight double rows, and (4) the spicules of the sterile stalk are very characteristic, even diagnostic. They consist of irregular multiradiates, suggestive of actively moving amoebæ, and similar forms with a distinct median constriction. Hence the specific name.

Diagnosis: Umbellate; polyps in dense groups at the ends of the terminal branches; polyp stalks very long; supporting bundle weak; point spicules 6—8 pairs; Grade II; spicules of the sterile stalk: (1) irregular multiradiates suggestive of actively moving amoebæ; (2) similar forms with a distinct median constriction and (3) capstan-like bodies.

Anthocodial Grade and Formula:

$$\text{II} = 6\text{—}8\ \text{p} + \text{o}\ \text{Cr} + \text{weak S. B.}$$

Descriptive Notes:

Colony as a whole. Seventeen specimens from Station 302 range from 1.5 cm. in height to 17 cm. The mode of growth in all the specimens is noteworthy. The relative proportion in the various parts is fairly constant. In the largest specimen, the basal part of the sterile stalk bears numerous stolons, and is 3.5 cm. long. It is markedly flattened (or collapsed) and is 3.5 cm. in breadth. From this arises a hard densely spiculose collar 6 cm. across. Surmounting this is a long sterile stalk 6 cm. in length which gradually tapers to 1 cm. and then again expands to carry the true polyparium, which is loosely glomerate and extremely soft and limp. In this (the largest) specimen two limp branches arise at the upper junction of the collar and stem.

Branching. The polyparium is strongly branched. The main branches subdivide several times. All the branches are limp and in the preserved specimens collapsed.

Colouring. The colour of the stalk and branches is a dirty white. The collar is a conspicuous red with white anthocodiæ. The stalks of the polyps in the polyparium contain numerous small red spicules, but the anthocodiæ are white.

Polyp stalks and their spicules. The length and the spiculation of the polyp stalks varies markedly in the collar and polyparium. In the collar they are very long, often 3 mm., and densely spiculose. In the polyparium they are much shorter and contain only a few red spicules. In this region the length seldom exceeds 1.5 mm.

Polyps. The polyps are clustered in small umbels at the ends of the branches in the polyparium, and on offshoots from the foliaceous collar.

Supporting bundle. In the polyparium the supporting bundle is weak and in many cases takes the form of a dorsal ridge or an ensheathing narrow triangle of 3—5 pairs; but in the foliaceous collar it is much stronger, with the uppermost one or two spindles projecting beyond the base of the anthocodia.

Anthocodiæ. In the polyparium the armature consists of about six very indistinct double rows, and on the ventral surface the spicules of a row are reduced in number. In the foliaceous

collar the longitudinal rows are more prominent, and there may be as many as 7 or even 8 pairs in the dorsal rows.

Spicules. The spicules of the sterile stalk are very characteristic. The predominant types are (1) irregular multiradiates suggestive of actively moving amoebæ; (2) similar forms with a distinct median constriction; and (3) small capstan-like bodies.

Locality: Station 302.

Three small colonies from Station 51, Molo Str., 30—50 fathoms, must also be referred to this species. They all show the same mode of growth. In one specimen the foliaceous collar is pinkish and in the other white, but in both cases the polyps are red and the anthocodiæ white. The sterile stalk is more densely spiculose and the supporting bundle is stronger. The armature of the anthocodiæ is exactly as above.

General Notes. In some of the colonies the hard foliaceous collar is turned downwards, in others upwards. The latter one would expect to be the normal position in life, and the former the position assumed during preservation. It tends to show, however, that the collar, though hard, is flexible in life.

In the upper part of the large colony figured there are numerous galls due to and containing small Balanidæ.

19. *Dendronephthya florida* (Esper). (Plate XXVI, Fig. 5).

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, 1905, pp. 651—655.

Stat. 96. South-east side of Pearl-bank, Sulu-archipelago. 15 M. Lithothamnion-bottom. 1 Ex.
Stat. 99. 6°7′.5 N., 120°26′ E. 16—23 M. Lithothamnion-bottom. 1 Ex.

Anthocodial Grade and Formula:

III = 5—7 p + o Cr + strong S. B.

We refer to this species two umbellate specimens, one from Station 96 and another from Station 99. In both (*a*) the sterile stalk is short, (*b*) there is a foliaceous collar at the base of the polyparium, (*c*) the polyparium is globular, not markedly flattened, rigid and compact, and (*d*) the surface is not very regular but marked by irregular depressions.

In the first the sterile stalk is 1 cm. long, and the polyparium is 5 cm. in height and 5 cm. in maximum breadth. The colour of the sterile stalk is greyish, the foliaceous collar is white to orange, the lower branches are orange red with white polyps, the upper branches, which form the greater part of the colony, are chocolate red, as also are their polyps.

In the second the sterile stalk is 0.5 cm. in length; the polyparium is 3 cm. in height and 3 cm. in breadth. The polyp-bearing branches and twigs are chocolate red, but the polyps are all white.

The anthocodial armature consists of 5—7 pairs of spindles of the hockey-club type, which fit closely together en chevron. The uppermost pair are distinctly longer and stronger than the others. Between the tips of the points there is often an interpolation of small spindles. The degree of projection of the tips of the points varies considerably in the different parts of the colony, but this feature depends on the degree of contraction of the polyp. The tentacles are densely covered with small spicules.

Spicules: One of the outstanding characteristics of the spicules is the tendency to foliaceous development — a feature which is emphasised by WRIGHT and STUDER in the description of *D. corymbosa* (united by KÜKENTHAL with *D. florida*). They speak of forms which correspond to the spiny folia of a foliaceous club, whose peduncle is almost entirely reduced.

The spicules may be divided into four main groups.

(1) (*a*) Smooth or slightly spiny spindles;
(*b*) long spindles with compound spines much more strongly developed on one side;
(*c*) spindles in which these compound spines become more and more foliaceous;
(*d*) kneed spindles with the foliaceous expansion confined to the middle portion, resulting in
(*e*) forms in which the ends of the spindle disappear and only the median foliaceous part remains.

(2) Some spindles bifurcate and this results in triradiates; in some both ends bifurcate and quadriradiates arise. From this type by further branching, multiradiates are derived. Many of these multiradiates are branched practically in one plane, but from the centre of others there stands out a central boss or compound knob, which in some forms tends to be foliaceous.

(3) Starting from minute, almost smooth, four-cornered capstans, there develop small flat stars much less densely spinose, some remaining flat, others becoming, through allround development of spines, almost discoidal.

(4) Another quite distinct type is represented by spindle-shaped and bracket-shaped, flat, almost smooth irregular forms.

Previously recorded from the Philippines, Hong Kong and the Arafura Sea.

20. *Dendronephthya stolonifera* (May). (Plate XVIII, Figs. 1—5).

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, 1905, pp. 635—636.

Stat. 49. 8° 20′.5 S., 119° 4′.5 E. 360 M. Coral and shells. 5 Ex.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 3 Ex.

Anthocodial Grade and Formula:

$$\text{III} = 5—6\ \text{p} + \text{o}\ \text{Cr} + \text{weak S. B.}$$

In the collection there are three specimens from Station 260 and five from Station 49, which we would refer to this species. The three specimens from Station 260 were at first puzzling, since they are distinctly divaricate in the general branching (See Plate XVIII, figs. 1—3). This is most marked in the youngest colony (Plate XVIII, fig. 1), but in the older colonies the definite umbellate character begins to appear. The five colonies from Station 49 are distinctly umbellate and flattened. Two of these are figured (Plate XVIII, fig. 4 and 5). It should be noted, however, that in even the smallest colony, the polyps are grouped in umbels on the twigs and these again combine into larger umbels. For this reason they must be placed within the group Umbellatæ, as defined by KÜKENTHAL. The different proportions of stalk to polyparium in the three small colonies are noteworthy. The lengths of the stalks are 1.5 cm., 2 cm. and 6 cm., respectively, while the heights of the polyparium are 4 cm., 4 cm., and 5 cm.

Very characteristic of all the colonies is the foliaceous collar at the base of the polyparium. This completely encircles the stem. The colour of all the specimens is identical. The stalk, the foliaceous collar, and the lower part of the polyparium are yellowish white, but this gradually

merges upwards into a reddish chocolate. This is due to the colouration of the spicules of the polyp stalks and anthocodiæ.

The long spindles are thinly warted, not, as KÜKENTHAL said, distantly spined. The spicules of the lower cortex, however, agree well with his description.

Worthy of note is the occurrence of spicules on a smaller scale than those already described. They are irregular but capstan-like, and may be regarded as the first stages of the warty irregular radiates.

Previously recorded from Japan.

21. *Dendronephthya dofleini* Kük. (Plate XXVI, Fig. 6).

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, 1905, pp. 662—5.

Stat. 258. Tual-anchorage, Kei Islands. 22 M. Lithothamnion, sand and coral. 1 Ex.

Anthocodial Grade and Formula:

III = 5 p + o Cr + strong S. B.

We refer to this species a small, almost globular, compact Umbellate colony, 5 cm. in height and 5 cm. in breadth. From a uniform grouping of the umbels there results a more or less uniform surface. It belongs to KÜKENTHAL's *florida*-group, section 2 (short polyp stalk). Within this section it agrees with *D. dofleini* in the following details:

(1) each anthocodial point consists of 5 pairs of en chevron spindles, very regularly arranged, the two uppermost longer and stronger and sometimes projecting. Many of the polyps show, as KÜKENTHAL describes, no projection of the uppermost spicules of the en chevron rows or only a slight one, whereas an almost equal number may be seen with eight markedly projecting spicules. In our judgment this difference depends entirely on the degree of retraction of the polyp;

(2) between the points of the anthocodiæ small intermediate spicules occur;

(3) the supporting bundle is strong and may project for 1 mm.;

(4) the upper cortex contains long curved spindles;

(5) in the lower cortex there are strongly spinose and warty spindles. These pass to triradiates and quadriradiates and to warty stellate forms.

The general form of the colony approaches more closely to KÜKENTHAL's first type, (viz. compact), with which it also agrees in the proportion of stalk to polyparium and in the general colour scheme. The general impression is a rich cream, but examination with a lens reveals that the tips of many of the projecting spicules of the supporting bundle are pinkish or red.

Previously recorded from Hong Kong and the Malay Peninsula.

22. *Dendronephthya armifer* n. sp. (Plate XXVI, Fig. 2).

Stat. Not recorded. 1 Ex.

Diagnosis: Umbellate; outline uniform, compact, disc-like; polyps globular, standing at right angles to the supporting bundle; polyps in bundles of twelve or so; bundles so crowded that an almost continuous surface is presented; supporting bundle strong with a single spicule projecting over 1 mm.; point spicules 4—6 pairs arranged in a very uniform isosceles triangle; none projecting; Grade III; spicules of the lower cortex, one-sided curved spindles approaching

foliaceous, triradiates and warty multiradiates, warty spheroidal forms, rounded multiradiates and smooth amoeboids.

Anthocodial Grade and Formula:

III = 4—6 p + o Cr + strong S. B.

The colony has a very short narrow stalk, less than 1 cm. in length, while the polyparium is 5 cm. high and 4.5 cm. in breadth. It is very compact and markedly flattened in one plane. The lowest branches are distinctly foliaceous and form an almost uninterrupted collar. The length of the polyp stalk varies considerably in different parts of the colony and even in the same bundle. Some of the polyps have long stalks while others are practically sessile. The supporting bundle is strong with one spicule markedly projecting. The points consist of 4—6 pairs arranged very distinctly en chevron. Four, five and six pairs are equally common.

The spicules of the lower cortex are very characteristic. They consist of:

(*a*) large spindles, straight but mostly curved, some "kneed". The most obvious feature is the enormous development of spines and warts on the convex side. The middle of the convex side is covered with compound warts, but these taper off to simple spines at the two ends. Some of the spindles are so dentate on the convex side that a foliaceous appearance results;

(*b*) some of the spindles bifurcate and give rise to triradiates of which one ray is stronger than the other two. These again give rise to starfish-like forms, and these again pass into multiradiates densely covered with tuberosities;

(*c*) very numerous, on a different line, are spheroidal forms with thorny prominences, derivable from small capstans;

(*d*) from these small capstans there also arise minute 4—5 rayed forms which develop into strong rounded multiradiates;

(*e*) different from all these types are flat smooth disc-like amoeboid forms.

This species is not far removed from *D. dofleini*, but nowhere throughout the whole colony was it possible to discover any projection of the chevron rows nor any marked exaggeration in size of the uppermost pair. The nature of the spiculation in this species also separates it off quite definitely from *D. dofleini*.

The colour of the colony is creamy, but the projecting spicule of the supporting bundle is a bright red, which gives the colony a mottled reddish appearance.

Locality: Not recorded.

23. *Dendronephthya hyalina* Kük. (Plate XX, Fig. 16).

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, 1905, pp. 688—9.

Stat. 213. Saleyer. Up to 36 M. Mud with sand.
Stat. 257. In Duroa-strait, Kei Islands. Up to 52 M. Coral.
Stat. 318. 6° 36'.5 S., 114° 55'.5 E. 88 M. Fine, yellowish grey mud.
Stat. 321. 6° 5'.5 S., 113° 30' E. 82 M. Fine, grey mud.

Diagnosis: Umbellate; flaccid; hyaline; umbels not in large hemispherical groups; outline not uniform; distinct foliaceous collar; polyps loosely aggregated; polyp stalks medium; supporting bundle strong; point spicules 4—5 pairs, with at most a slight projection of the uppermost pair; grade III; spicules: sterile stalk has numerous stellate and multiradiate forms.

Anthocodial Grade and Formula:

III = 4—5 p + o Cr + strong S. B.

Descriptive Notes:

Colony as a whole. Eight young colonies, the largest of which is 6.5 cm. high. They are very flaccid in texture and hyaline in appearance. The youngest forms show little hint of umbellate branching, but this is well marked in the biggest. As the umbels do not compose large hemispherical groups, the specimens should be referred to section B of KÜKENTHAL's Umbellatæ, and the presence of unequally long branches, resulting in no very uniform outline, points to the *spinulosa*-group.

Branching. There is a distinct foliaceous collar. Branches unequal.

Colouring. Cortex very hyaline, bearing loosely disposed white spicules.

Polyp stalks. Slightly over 1 mm. long.

Polyps. Few are in good condition, owing to the colonies having been in most cases much compressed; the polyps occur in small bundles of three or four. The anthocodial points consist of 4—5 pairs en chevron, with almost no specialisation of the uppermost pair.

The supporting bundle is fairly well developed, and the strongest spicule may project for half a millimetre.

Other spicules. The sterile stalk shows numerous stellate and multiradiate spicules.

Previously recorded from Pescadores.

24. *Dendronephthya collaris* (Wr. & Stud.). (Plate XX, Fig. 6).

For description see: WRIGHT & STUDER, Report Challenger, vol. XXXI, 1889, pp. 208—210.

Stat. 99. 6° 7'.5 N., 120° 26' E. 16—23 M. Lithothamnion-bottom. 3 Ex.

Diagnosis: Umbellate; contour irregular; basal branches foliaceous and forming a collar; polyps arranged in small roundish masses: polyp stalks long; supporting bundle very strong; point spicules 5—6 pairs with one of the uppermost pair stronger and sometimes projecting; grade IV.; spicules: very abundant spindles on the polyp stalks; on the polyps, but not on the collar, sigmoid spindles; on the collar irregular interlocking quadrangular "crosses".

Anthocodial Grade and Formula:

IV = 5—6 p + o Cr + very strong S. B.

Descriptive Notes:

Colony as a whole. Two colonies, of which the larger is, as regards the polyparium, 9.5 cm. high, 12 cm. broad, and 5 cm. in thickness.

Branching. Umbellate, referable to KÜKENTHAL's subsection with the umbels forming large hemispherical masses, and to the *collaris*-group, where the contour is broken by the clefts between the masses. It differs markedly in having only a short stalk, but this is probably only a growth condition related to the nature of the substratum. At the top of the short stalk the basal branches are foliaceous and form a collar.

Colouring. Polyps of the foliaceous collar are bright red; those of the rest of the colony white (not purple as in the "Challenger" specimen), but some of them show a tinge of red.

Polyp stalks are long. They are covered with spindles almost en chevron. Polyps

arranged in small roundish masses. The anthocodial armature shows eight points of 5—6 converging pairs of spindles, and one at the top of each row may be much stronger than its neighbour and project beyond the polyp. These 8 projecting spines catch the eye at once.

The supporting bundle is very strong, with one spindle projecting far beyond the polyp.

Other spicules. The predominant spicules of the polyps, apart from those on the collar, are spinulate slightly sigmoid spindles, the "f's" of the "Challenger" description. The abundant spindles on the polyp stalks are almost en chevron. The characteristic spicules of the collar region are irregularly quadrangular bodies with very rough protuberances which secure interlocking. They correspond to what are called "crosses" by WRIGHT and STUDER. There are also spindles enlarged at one end into very rough clubs (pseudo-clubs), curved spindles with very strong protuberances on the convex side, and irregular bodies like teeth with many roots.

Locality: Station 99.

A larger colony, flattened from side to side, may also be referred to *D. collaris*. Here the polyparium is markedly oval in cross section. There is in this specimen no hint of any projection from the anthocodial points (which consists of 5—6 equal pairs en chevron). The lower cortex shows, among other forms, numerous flattened, spindle-shaped, triradiate, boomerang-like, and irregular spicules, which were not noticed in the other colonies studied. A marked feature is the length and strength of the prongs arising from some of the curved spindles, pseudo-clubs, and irregular multiradiate bodies.

Previously recorded from Kei.

25. *Dendronephthya reticulata* n. sp. (Plate III, Fig. 6).

Stat. 79. 2°43′ S., 117°44′ E. 41—54 M. Fine coral sand. 1 Ex.

Diagnosis: Umbellate; much branched; soft and flabby; polyps in small rigid umbellate groups at the tips of the small branches; polyp stalks long and naked; point spicules 3—5 pairs, one or both of the uppermost pair projecting; supporting bundle strong; cortex spicules of the branches long, straight or curved; numerous opaque white spindles give the surface a reticulate appearance.

Anthocodial Grade and Formula:

$$IV = 3—5\ p + o\ Cr + \text{strong S. B.}$$

Descriptive Notes:

Colony as a whole. A very flabby colony from which the sterile stalk has been broken off. When lying flat it shows a circular outline, 5 cm. in diameter.

Branching. From the top of the sterile stalk there arise three main branches which again divide and subdivide.

Colouring. The general colour is a deep ash-grey, strangely tinged with green, but the large spindles are opalescent and give the surface of the colony a reticulate appearance. The spicules of the points are rose red.

Polyp stalks. The polyp stalks are long and naked. The polyps are arranged in small umbels at the tips of the small branches.

The anthocodial armature consists of eight groups of 3—5 en chevron pairs, but 4 is the most common number. These points are very prominent on account of their colour and the

long naked polyp stalk. There is a marked projection of one or both of the uppermost pair. The supporting bundle consists of several long strong spindles; one generally predominates, extending beyond the polyp.

Other spicules. The spicules of the coenenchyma are white and opaque. They consist of long, slender, sometimes bent, warty spindles. The general appearance is reticulate and suggestive of KÜKENTHAL's *D. filigrana*. As the sterile stalk is absent, it is not possible to ascertain the spicules of that region.

Deduction. Umbellate; KÜKENTHAL's section B.; *spinulosa*-group.

26. *Dendronephthya lutea* Kük. (Plate III, Fig. 2).

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, II, 1905, p. 689—691.

Stat. Not recorded. 8 Ex.

Anthocodial Grade and Formula:

$$IV = 2—4\ p + o\ Cr + \text{strong S. B.}$$

There are in the collection eight interesting specimens with characteristic features agreeing well with *D. lutea* Kükenthal except as regards the cortex and canal-wall spicules.

The polyps are undoubtedly arranged in umbel-like groups; therefore the colonies should be referred to the section Umbellatae. The umbels, however, do not form large hemispherical masses; and the branches, being of unequal length, do not present a uniform surface. Therefore the colonies must be included in KÜKENTHAL's *spinulosa*-group, within which they agree well with *D. lutea*.

Among the outstanding agreements are the following:

(1) The lowest branches are conspicuously foliaceous, but there is an elongated sterile region between the folia and the polyparium proper.
(2) The upper branches are "but short and divide with repeated dichotomy".
(3) In the upper region "small somewhat markedly diverging polyp-bundles form small upward-directed umbels".
(4) In general the polyps are on the surface but sometimes they occupy a deeper position.
(5) The points consist of 2—4 pairs of converging spicules, the uppermost markedly projecting while the lowest two pairs occupy a more horizontal position. This is due, however, in some degree to contraction.
(6) The umbellate groups are characterised, as KÜKENTHAL notes, by their divergent outspreading, suggestive of a group of antlers. In many cases the branching is more corymbose than umbellate.
(7) The supporting bundle is strongly developed, one spicule sometimes projecting for 2.5 mm. but in some cases only 0.6 mm.
(8) The colour scheme is the same.

There are some very striking features in these specimens:

(1) On the outer surface of the smaller branches there is a distinct strengthening due to a grouping of the long spindles. This strengthening is continued into the still smaller branches when they divide. It is again continued in the polyp stalk as a supporting bundle.
(2) The polyp stalk is conspicuously slender and is dominated by the supporting bundle.

Spicules: The spicules of the cortex and canal-walls consist of (1) warty spindles; (2) bifurcated forms arising from these; (3) long triradiates in which the three divisions are of about the same length; and (4) quadriradiates in which both ends of the spindle bifurcate.

Unfortunately we have been unable to verify the occurence of stellate spicules in the cortex and canal-walls, but with so many points of agreement we do not feel justified in establishing a new species.

Previously recorded from the Bay of Bengal.

27. *Dendronephthya disciformis* Kük. (Plate XX, fig. 8; Plate XXVI, figs. 1 and 1*a*).

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, 1905, II, pp. 636—638.

Stat. 99. 6°7′.5 N., 120°26′ E. 16—23 M. Lithothamnion-bottom. 4 Ex.
Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 2 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion; sand and coral. 5 Ex.
Stat. 279. Ruma-Kuda-bay, Roma-island. 36 M. Mud and sand. 3 Ex.

Diagnosis: Umbellate; compact; disc-like; outline uniform; polyps in bundles of 6—10; polyp stalks medium; supporting bundle very strong; point spicules about five pairs, with the uppermost larger spicule predominating and projecting; grade IV; spicules: in the upper cortex long, curved spindles (2 mm.); in the lower cortex stout spindles, irregular stellate bodies for interlocking, and large triradiates and quadriradiates.

Anthocodial Grade and Formula:

IV = 1 + 4 P + 0 Cr + very strong S. B.

Descriptive Notes:

Colony as a whole. Compact, with its umbels arranged in larger hemispherical masses which are superficially in contact, forming in most cases a uniform outline.

Branching. From the uniform outline and the arrangement of the umbels in large hemispherical masses, it should evidently be referred to KÜKENTHAL's section Umbellatae, first division, *disciformis*-group.

Polyp stalks not over 1 mm. long. Polyps in small bundles of 6—10. In the anthocodial armature there are 4—5 pairs of converging spindles en chevron in each of the eight points and above these a much larger converging spindle rising almost 0.5 mm. beyond the polyp. In rare cases two spindles share in the projection, which is very characteristic. Below the points there is a vague "crown", and there are 2—4 small intermediates between the points. All these spicules are whitish.

In the supporting bundle about three very strong densely spinose curved spindles project beyond the anthocodiæ, one being stronger than the others, and these are based in smaller but still strong spindles. The largest spindle has a length of 4 mm. and shows a distinctly smooth tip (cf. *D. gigantea*).

Other spicules. The upper cortex is densely covered with long curved spindles, mostly in longitudinal arrangement, many of them 2 mm. in length. Only some of them show the distant fine spines that KÜKENTHAL describes; most are covered somewhat densely.

The lower cortex shows (a) stout spindles with long conical tubercles; (b) very numerous small irregular stars with longish prongs, which may again be divided and are suited for inter-

locking; (c) large triradiates and quadriradiates covered with strong tubercles, sometimes massive and compound. A typical triradiate is about 1 mm. in maximum length, which is much larger than KÜKENTHAL notes. But, of course, they occur in many sizes.

There are in the collection 14 specimens, from 4 stations, which we would refer to this species. (*a*) Four small almost globular colonies, of a general pink colour, have short sterile stalks from the bases of which numerous stolons arise.

In the largest the polyparium is 4.5 cm. in height and 5 cm. in diameter. The spicules of the branches and twigs are pink, but the polyps are white. The projecting anthocodial points are very marked in the largest colony, not so much in the three smaller ones. As we have noted elsewhere, however, this depends to a great extent on the degree of retraction of the polyp.

Locality: Station 99.

(*b*) One small colony and a portion of what was evidently a colony of about the same size. The spicules of the coenenchyma and the supporting bundle are dark red, but the anthocodiæ are white.

Locality: Station 258.

(*c*) A portion of what was evidently a large colony. The spicules of the stem, branches, and supporting bundle are white, but in the majority of the polyps the anthocodial armature is red. The specimen is very badly damaged, but we feel justified in assigning it to this species.

Locality: Station 258.

(*d*) Two complete colonies and a portion of another colony about the same size. In one colony the main stem divides into two large branches, each of which is distinctly spherical. In the other there are three main branches each of which again divides in two. A very marked feature is the enormous development of foliaceous branches at the top of the short sterile stalk. In the foliaceous expansion and on the lowest branches the colour is orange, but there are a few scattered red spicules in the coenenchyma. In the polyparium proper the branches are red, the polyps white, the anthocodial armature red.

Locality: Station 279, 10—25 fathoms.

(*e*) A small compact almost spherical colony, 5 cm. in diameter. The sterile stalk is very short. The general colour of the coenenchyma is white, but some of the spicules of the twigs and the projecting spicule of the supporting bundle are red. The spicules of the anthocodiæ are white.

Locality: Not recorded.

There are also in the collection four small colonies, two from Station 164 and two from Station 258, which agree in anthocodial armature, but are distinctly divaricate in growth and show no hint of being globular or compact.

They are all markedly flattened in one plane. They belong, however, to the Umbellatæ, and show, as in the case of some other species, like *D. stolonifera*, that Umbellates sometimes pass through a divaricate stage in their general branching.

Previously recorded from the China Sea.

28. *Dendronephthya pumilio* (Stud.). (Plate XX, Fig. 10).

For description see: STUDER, Ann. Mag. Nat. Hist. (6) vol. I, 1888. pp. 70—71.

Stat. 99. 6° 7'.5 N., 120° 26' E. 16—23 M. Lithothamnion-bottom. 4 Ex.

Stat. 258. Tual-anchorage, Kei-islands. 22 M. Lithothamnion; sand and coral. 1 Ex.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 M. Sand and shells. Stones. 1 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 1 Ex.
Stat. Unrecorded. 4 Ex.

Diagnosis: Umbellate; branches in rounded bunches closely packed; general shape flat to globose; polyps on the terminal twigs; polyp stalks long; polyps stand out nearly always at right angles; supporting bundle very strong with sometimes a single spicule predominating, in other cases with two or three of equal length; point spicules about 3—5 pairs, the uppermost elongated, sometimes very pronouncedly, sometimes not so markedly; grade IV.; spicules: lower cortex has thick, bent, thorny spindles, but no distinct stars.

Anthocodial Grade and Formula:

$$IV = I + 4\,p + o\,Cr + \text{very strong S. B.}$$

Descriptive Notes:

Colony as a whole. Four interesting specimens at different stages of growth, the largest having the following dimensions: total height 16 cm., height of sterile stalk 6.5 cm., breadth of polyparium 9.5 cm. The general branching of the colony is distinctly umbellate in its largest forms, but less so in the younger forms, which tend to be much flattened.

Branching. The branches form rounded bunches, closely packed together and forming in the larger colonies a markedly uniform contour. The general shape varies from flat to globose, but little importance can be attached to this.

Colouring. Yellow white, polyps dark red.

Polyp stalks long. Polyps arranged on the terminal twigs. The anthocodial armature is marked by the elongation of one or both of the terminal spicules of each point, the others, to the number of 2 or 3 pairs, being markedly subordinate. This is grade IV.

The tentacles are long and heavily armoured, bearing dorsally a crowd, sometimes bilinear, of minute oval or rod-like reddish spicules.

The supporting bundle is very strong, the largest spindle often projecting for 1 mm. The spicules are finely and thickly spinose, and often show smooth points. In many cases one polyp and its supporting bundle may be seen to predominate markedly over the others in the group.

Other spicules. The spicules of the lower cortex are mostly thick spindles, usually bent, and densely covered with strong, blunt, thorns, often compound. These bent spindles often develop a knee with a marked prominence on the convex side, leading to a distinct bracket-like form. There are numerous triradiates of a rough type and numerous small capstans. No distinct stars were seen.

Locality: Station 99.

Seven other colonies must also be referred to this species.

(1) A small colony considerably flattened, of a general orange red colour. The spicules of the sterile stalk and branches are white, but those of the polyp stem, the supporting bundle, and the anthocodiæ are orange red. The spicules of the tentacles are bright red and catch the eye very markedly.

Locality: Station 315.

(2) An almost spherical colony with a bare patch on one side where it had evidently been

resting on a rock. The sterile stem and branches are white, but the polyp armature is pale orange. The projecting tips of the supporting bundle are often tinted orange.

Locality: Station 274.

(3) A small colony identical with the specimen from Station 99.

Locality: Station 258.

(4) Two small colonies identical with (3).

Locality: Not recorded.

(5) A small colony: the spicules of the sterile stem are red, those of the main branches white, those of the secondary branches, the supporting bundle, and the polyps, red. The whole colony is rather open, not nearly so compact as the preceding, but the anthocodial structure is identical.

Locality: Not recorded.

(6) A large colony with a sterile stalk 4.5 cm. long and 2.5 cm. in diameter. The polyparium is 10 cm. high and 9.5 cm. wide. It is distinctly lobose. The lobes are confluent, giving the colony an undulating appearance. This specimen closely resembles the large specimen referred to by SHERRIFFS.

Locality: Not recorded.

Previously recorded from Japan.

29. *Dendronephthya rubescens* n. sp.

Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 M. Sand and shells. Stones. 3 Ex.

For three rather perplexing umbellate specimens from Station 274 we have been compelled to establish a new species, *D. rubescens*.

Anthocodial Grade and Formula:

$$V = 3—5\ p + 2\ Cr + \text{very strong S. B.}$$

The three colonies are all about the same size, the largest has a sterile stalk 1 cm. long. The polyparium is rounded and not markedly flattened. It is 4.5 cm. in height and 3 cm. in diameter. The whole colony has a mottled appearance; some of the polyps are red, others are white, while in some the spicules are partly red and partly white. The contour is not regular, but marked by large and small indefinite depressions.

This new species is in the close vicinity of *D. coronata*, with which it agrees in the following features:

(1) the anthocodial armature consists of 3—5 pairs of slightly kneed spindles arranged en chevron. Of these the two uppermost are strongest. Towards the base in the more contracted polyps, the lowermost pair or two pairs approach a horizontal position and so give the appearance of a pseudo-crown;

(2) between each point there occur small intermediate spindles;

(3) the supporting bundle is strong but simple, and very coherent; it is mainly due to a single needle often 3 mm. in length, which may project for 0.5 mm.;

(4) the polyps occur in bundles of 6—12, and these with the neighbouring bundles form close irregular concave groups. It is this feature which accounts for the indefinite depressions in the polyparium.

On the other hand (1) it cannot be said that the stalks of the polyps are elongated, "lank up to 2 mm."; for those of a compact bundle have never more than a short stalk and this is, in many cases, absent.

(2) Another difference, to which, however, we do not attach much importance, is the absence of projecting spicules in the great majority of the anthocodiæ. In the Challenger figure of *D. coronata* many of the polyps are shown with very projecting spicules and the name *coronata* was given in reference to "the fact that the spicules project above the margin like the points of a crown".

WRIGHT and STUDER add, however, that the points can also "close together over the mouth like a lid". This is in entire agreement with our view that the projection or non-projection of upper spicules depends upon the degree of polyp contraction and should not be regarded as diagnostic. Much more important is the question as to whether the uppermost pair is markedly stronger than those below.

Spicules: The various types of spicules previously described for *D. coronata* are present in these specimens, e.g. spindles, triradiates and quadriradiates, but in addition to these there are kneed spindles with one side more warty than the other and with a marked lateral expansion of the warts. In some of the spindles this asymmetry results in a distinct foliaceous expansion. There are also four-cornered capstans from which arise warty irregulars, sometimes with a rough boss in the centre. These warty irregulars may develop into flat multiradiates. Small smooth transparent irregulars also occur.

30. *Dendronephthya coronata* (Wr. & Stud.). (Plate XX, Fig. 11).

For description see: WRIGHT & STUDER, in Report Challenger, vol. XXI, 1889, pp. 212—213.

Stat. Not recorded. 1 Ex.

Diagnosis: Umbellate; polyps not grouped in small hemispherical heads; outline uniform; polyps in small loose bundles of 3—5; polyp stalks medium, rather long than short; supporting bundle very strong; point spicules 3—4 pairs, the upper pair, or one of them, markedly projecting; pseudo-crown of three rows of roughly horizontal spindles; grade V.; spicules: cortex of the stem shows stout, thick spindles strongly tuberculate, also triradiates, quadriradiates, and irregular forms.

Anthocodial Grade and Formula:

$$V = 3—4\ p + 3\ Cr + \text{very strong S. B.}$$

Descriptive Notes:

Colony as a whole. A small colony with polyps in distinct umbels, but not grouped in small hemispherical heads and forming as a whole a fairly uniform outline, agrees in general with *D. coronata*, especially as revised by KÜKENTHAL. It belongs to his *florida*-group of Umbellatae, being slightly flattened in a longitudinal oval and showing a convex upper surface to the umbels.

Branching. The branches of the stem lead to the formation of large hemispherical masses of polyps.

Colouring. The general colour of the colony is orange red.

The polyp stalks vary greatly in length as noted by WRIGHT and STUDER, and may attain a length of 2 mm.

The polyps are arranged in small, loose bundles of 3—5.

The anthocodial armature shows 3—4 pairs of curved, thorny spindles en chèvron, the upper pair or one of the upper pair markedly projecting over the base of the tentacles. In some of the polyps with shorter stalk each point consists of about 3 pairs almost equal in size. Between the points there are often one or two accessories. Below these is a pseudo-crown of several rows (often three) of roughly horizontal spindles, and below these again are larger spicules which merge into those of the polyp stalk.

The supporting bundle is very strong, and one spindle over 3 mm. in length projects for a distance of a little over 1 mm. beyond the polyp head; it is flanked basally on each side by one or more almost equally strong, and lateral to these are smaller spicules. KÜKENTHAL's reference to the Challenger Report description of the supporting bundle as "weakly developed" is a misunderstanding of WRIGHT and STUDER's sentence which referred only to certain close-packed polyps with coalescent stalks. The strength of the supporting bundle is emphatically shown in WRIGHT and STUDER's figure.

Other spicules. The cortex of the stem shows stout, thick spindles with strong tubercles, many markedly compound, truncated, and along with these only a few triradiates and quadriradiates besides smaller exceedingly irregular warty bodies, often like the broken heads of clubs. There are also several grades of capstans culminating in bossed multiradiate stars.

Previously recorded from Torres Straits.

31. *Dendronephthya longicaulis* Kük. (Plate XX, Fig. 7).

For description see: KÜKENTHAL, Versuch einer Revision der Alcyonarien, 1905, II, pp. 633–634.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.

Diagnosis: Umbellate; very long stalked; somewhat flattened polyparium; basal branches foliaceous and forming a collar; polyps in small, loose umbellate groups; polyp stalks usually short, but may reach a length of 2 mm.; supporting bundle weak; point spicules one pair only, one of which is stronger; pseudo-crown of numerous spicules; grade VI; spicules: cortex of the branches covered with stout spindles bluntly tuberculate, cortex of the stalk with many stellate forms.

Anthocodial Grade and Formula:

$$VI = I + 1\ P + 4—6\ Cr + \text{weak S. B.}$$

Descriptive Notes:

Colony as a whole. A single, peculiar specimen unlike any other in the collection; marked by a long flexible stalk (10 cm. out of a total of 13); of uniform diameter (1.3 cm.); and bearing a rather loose umbellate polyparium, somewhat flattened.

Branching. The basal branches of the polyparium are foliaceous and form a collar turned downwards. There are but few branches extending transversely, so that the top of the polyparium appears rather truncate.

Colouring. General surface of the cortex is pinkish white, the polyp stalks reddish brown, while the anthocodial spicules are almost translucent.

Polyp stalks are on an average about 1 mm. long, but a length of 2 mm. may be attained. They appear to be bare on the ventral side. The bundles of polyps are disposed in small loose umbellate groups. The upper part of the stalk, however, as KÜKENTHAL describes, shows an incrustation of minute polyps.

Polyp spicules. The anthocodial armature conforms with KÜKENTHAL's figure, but we should describe it somewhat differently, for it seems to us to have in each true point only one pair, one member of which is distinctly larger than the other, all the other (4—6) spicules being referable to the crown. He described it as consisting of (*a*) two closely apposed spicules forming the upper part of the point, (*b*) below these 1—2 pairs of horizontals forming what we call a pseudo-crown, and (*c*) below that again 3—4 converging pairs, merging with the accessories of the supporting bundle, which is very short, scarcely projecting.

Other spicules. The cortex of the branches is closely covered with strong spindles of typical shape and with blunt tubercles — a feature in which this specimen does not conform to KÜKENTHAL's description of *D. longicaulis*, where "the branch-cortex contains isolated longitudinally disposed very narrow spindles with sharp thorns".

On the other hand, the cortex of the stalk shows a close array of stars as KÜKENTHAL describes, and with the same average diameter of 0.1 mm. Among the stars are a few broad, short, densely tuberculate spindles.

Previously recorded from Japan.

32. *Dendronephthya simplex* Sherriffs. (Plate XX, Fig. 15).

Stat. Not recorded. 1 Ex.

Diagnosis: Umbellate; compact; slightly flattened umbels not combined into large hemispherical masses; lower branches foliaceous; contour uniform; polyps compact; polyp stalks short; supporting bundle strong; point spicules, a single converging pair; pseudo-crown of some three rows of curved spindles; grade VI.; spicules: cortex has stout tuberculate spindles but no stars.

Anthocodial Grade and Formula:

$$\text{VI} = 1 \text{ or } 2\,\text{P} + 3\,\text{Cr} + \text{strong S. B.}$$

Descriptive Notes:

Colony as a whole. The entire colony is 9 cm. in height, of which 2.5 cm. go to the sterile stalk. The breadth of the polyparium is 6 cm. The polyp-bearing twigs form small umbels, but these do not combine in larger hemispherical masses. The specimen should therefore be referred to KÜKENTHAL's second section of the Umbellatæ and to the *florida*-group, though the shape of the polyparium is circular rather than long oval. There is a uniform, very slightly interrupted contour to the whole colony, which has a somewhat flattened circular shape. The general appearance is compact. Practically the whole surface is covered by the polyps on their umbels, and no polyps occur except on the surface.

Branching. Some of the lower branches are foliaceous.

Colouring. On the whole the colour is drab-yellow.

Polyp stalk. Short polyps in compact bundles of 10 or so, forming dense corymbs. The anthocodial armature consists of eight points, each with two long converging spindles; and it

may be said at once that it is almost precisely that of *D. pütteri* (Divaricatæ) and not far from *D. lutea* (Umbellate, but with interrupted contour). The length of the point spicules is about 0.75 mm., but one is often slightly smaller than the other. Between the points there lies a pair of much smaller intermediates. At the base of the points there is a pseudo-crown of about three rows of curved spindles.

There is a strongly developed supporting bundle, the largest spicule of which, about 2 mm. in length, projects beyond the polyp for about 0.75 mm. It is abutted by two strong spindles on each side and by a number of smaller ones transitional to the polyp. The supporting-bundle spicules are slightly curved spindles, densely covered with relatively minute blunt and narrow cones. The spindles of the eight points are similar, but show the characteristic hockey-club-like bend at the base.

Other spicules. All over the cortex there is a felting of more irregular and stouter spindles, often "f" shaped, with larger and often compound blunt tubercles. No stellate forms occur, but there are very numerous, quite irregular types which might be derived from spindles with club-like ends or from boomerangs. Their compound warts are often very strong and may be predominantly strong on one side.

Genus **Stereonephthya**.

1. *Stereonephthya bellissima* n. sp. (Plate VII, Figs. 2, 3, 4 and 5).

Stat. Not recorded. 2 Ex.

We refer to this new very distinctive species two remarkably beautiful colonies with more branching than is usual in Stereonephthya. The polyp armature is pinkish red and stands out against a background of opal-white spicules. The colony is flaccid, the branches are elongated and digitiform, and the lower ones are peculiarly weak at the base, tending to be quite flat when collapsed. Associated with this may be noted the particularly delicate character of the canal walls, which do not contain spicules. The armature of the cortex is stronger in the upper branches of the polyparium, and this results in considerably greater rigidity. The branches come off quite irregularly, and the polyps may arise singly or in small groups which could not be described as bundles.

The whole of the stalk of the polyp is backed by the supporting bundle which arises from the branch at an angle of from 35° to 40°. The polyp stalk may attain a length of 2 mm. The supporting bundle is of the ensheathing type, with a strong projecting point consisting of one to three spindles.

The polyps are turned inwards and bent downwards at an acute angle often approaching 30°.

The anthocodial armature in the median dorsal en chevron row is well developed and consists of about six to eight pairs of very regularly arranged curved blunt reddish spindles. In the two lateral rows on each side the number of spicules diminishes and the average number is 3—4 pairs. The spicules in the three rows on the ventral surface are often almost quite suppressed. The tentacles are densely covered with small white spicules which in the contracted tentacles lie transversely.

This species shows some resemblance to *S. ulex* (Holm.) in (*a*) the mode of branching,

(*b*) the arrangement of the polyps, (*c*) the angle of origin of the polyps, (*d*) the nature of the supporting bundle, and (*e*) the angle at which the anthocodiæ arise from the stalk.

On the other hand it differs in the following respects. (1) The stem and branches are far from being "very rigid", (2) the arrangement in rows in the anthocodiæ is remarkably distinct, not indistinct as described by KÜKENTHAL for *S. ulex*, (3) the composition of the anthocodial rows is quite different. In *S. ulex* the dorsal and laterals have 10—15 pairs, the ventrals 5 pairs.

2. *Stereonephthya divergens* n. sp.

Stat. Not recorded. 1 Ex.

A remarkably flexible yellowish colony, basally attached to a branching hydroid. It consists of two main stems 1 cm. and 3 cm. in length, arising from a common flat base. The diameter of the stalk is 2 mm. but broadens upwards. At the top of the stems short branches arise, bearing singly disposed polyps. Each polyp has a short stalk of about 1 mm. in length, the dorsal surface ensheathed by a strong supporting bundle which starts at the base with about eight spindles but tapers to two or even one. In the majority it does not project beyond the polyp, which is bent down on its stalk at a very acute angle.

The anthocodial armature consists of eight points of 5 (sometimes 6 or 7) chevron pairs of spicules of almost equal size. In some of the polyps there is a pseudo-crown of one or two rows, but it must be noted that when such exists the number in the point is reduced, showing that these pseudo-crown spicules belong to the point and have come to be horizontally arranged because of the greater retraction of the polyp.

Among the very thorny spicules there is a predominance of straight and curved spindles, but a few pseudo-clubs occur and a few irregular multiradiate forms. The prominences of the spicules vary from sharply conical to truncated.

In the armature of the anthocodiæ and in the angle of polyp to stalk there is a suggestion of *S. papyracea* Kük., but in that species the supporting bundle usually projects for 1 mm. Moreover the stalk of the colony is very short and shows a membrane-like expansion. From *S. kükenthali* Th. & MacK., where there is the same sharp angle of polyp to stalk, this new species is distinguishable at a glance, for *S. kükenthali* is a rigid bush-like colony, the supporting bundle is much more massive and projecting, and the anthocodial points are ill defined.

3. *Stereonephthya ilex* n. sp. (Plate XXVII, Fig. 6).

Stat. Not recorded. 2 Ex.

Two small specimens of a very distinctive form marked by a predominance of short foliaceous branches, each suggestive of a holly leaf. The sterile stalk is very short. The largest specimen has a stalk of 1 cm. in length and a spreading polyparium of 2.5 cm. in height and a maximum breadth of 3 cm.

The polyp stalk is in most cases long and slender, and may be as much as 2.5 mm. in length, while the tip of the supporting bundle sometimes projects as far again. The supporting bundle is strong and of the buttress type. It may show two or three long white spicules, but most commonly there is only one. Very striking is the ventral armature of the polyp stalk,

which consists of numerous small spindles arranged en chevron with the point directed downwards. There may be as many as a dozen or fourteen pairs in each row on each side of the polyp-stalk.

The anthocodia is low and mamma-like and stands at right angles to the supporting bundle; but some, more elongated, have their mouths directed upwards.

The eight points are almost equally developed and their tips usually project. Each point consists of about three pairs of spicules. The uppermost pair is stronger than the others, and one of the pair is sometimes longer than the other.

The tentacles are heavily armoured.

The spicules of the lower cortex consist of the following types: (1) long warty spindles with the warts very markedly truncated; (2) short curved spindles, sometimes very distinctly kneed, with the warts more developed on one side, the warts often compound and sometimes even branched: (3) spindles with one end bifid; (4) modified spindles with one end expanded, sometimes indian-club-like, sometimes hockey-club-like, but in all cases very rough; (5) small capstans with a slight waist; and arising from these (6) irregular jagged forms, in most cases with a central boss.

4. *Stereonephthya imbricans* n. sp. (Plate VII, Figs. 9 and 11).

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.
Stat. 310. 8°30′ S., 119°7′.5 E. 73 M. Sand with few pieces of dead coral. 4 Ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 1 Ex.

To this new species we refer four colonies, from Station 310, of a pinkish brown colour. They are very rigid, the polyps are not in bundles, and the supporting bundle is of the ensheathing type, not projecting.

The largest specimen has a sterile stalk 4 cm. in height and 9 mm. in breadth, heavily armoured with large tuberculate spindles, which may attain a length of 4 mm. From the top of this sterile stalk about half a dozen short branches arise. These are covered with polyps, either singly or in small groups, which arise at short intervals.

Each polyp has a stalk about 1.2 mm. in length and a strong but not projecting supporting bundle. The supporting bundle is of the ensheathing type, narrowing from a broad triangular base to a blunt tip. The inward-bent polyp forms a continuous curve with the supporting bundle.

The anthocodial armature consists of eight points of three or four pairs of very rough, short, thick, blunt spindles, two of which may predominate over the others. The number of spicules in a point is reduced on the ventral side. At the base of the chevron there are often some horizontal or irregularly disposed spindles which merge into the spicules of the polyp stalk.

The tentacles are densely armoured.

The spicules of the sterile stalk are of 2 types: (1) large, broad, very tuberculate spindles with papillose or obtuse warts; and (2) narrower forms with conical spines.

A cream-coloured heavily armoured colony from Station 164, standing 3.5 cm. in height, and a colony of the same height and colour from Station 315, agree with the foregoing description and should be referred to this species.

5. *Stereonephthya macrospiculata* Th. and MacK. (Plate VII, Fig. 7).

For description see: THOMSON and MACKINNON, Alcyonarians of Percy Sladen Expedition. Trans. Linn. Soc. 1910, XIII, p. 186, 2 figs.

Stat. 12. 7° 15′ S., 115° 15′.6 E. 289 M. Mud and broken shells. 1 Ex.
Stat. 154. 0° 7′.2 N., 130° 25′.5 E. 83 M. Grey muddy sand, shells and Lithothamnion. 1 Ex.
Stat. 257. In Du-roa-strait, Kei-islands. To 52 M. Coral. 1 Ex.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 1 Ex.

A small densely spinose colony from Station 12, standing 2.5 cm. high and with three or four short branches, may be referred to this species, with the description of which it closely agrees. The following points are distinctive: (1) There are somewhat hockey-club-like spindles in the points, two in each point. There are also irregularly disposed small spindles between the points. (2) The base of the point forms a pseudo-crown of two, three or even four transverse rows. (3) The tentacles are heavily armoured on their dorsal surface. (4) The supporting bundle is massive but does not project. (5) Some of the densely warted spindles are of very large size, up to 5 mm. A few of these are forked at one or both ends. Some simple forms are broad at one end and narrow at the other, but there are no true clubs. Many of the spindles are relatively very broad, 0.5 mm. in breadth and 5 mm. in length. It may be noted that none of the large spicules approach the huge dimensions of 9 mm. × 1.5 mm. previously described; but this may depend on age.

A young form of this species from Station 289 is represented by a small yellowish white colony, 1.8 cm. in height, bearing only a few polyps. The massive spindles may attain a length of 3.5 mm.

A specimen from Station 260 has a total height of 1.9 cm., of which the stalk occupies 1.2 cm. The polyparium has a breadth of 1.8 cm.

Another small complete specimen from Station 257 is 1 cm. in height, while the maximum breadth of the polyparium is 1.3 cm.

We have figured a striking fragment from Station 154 (Plate VII, Fig. 7) on account of its gigantic spicules, which appear to be identical with those of the outside of *Stereonephthya macrospiculata*. The fragment has a length of 2.9 cm. and a maximum breadth of 6 mm. The spicules are rough curved spindles, often rather blunt. Some of them attain a length of 7 mm.

Previously recorded from the Solomon Islands.

6. *Stereonephthya pedunculata* n. sp.

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.
Stat. 305. Mid-channel in Solor-strait off Kampong Menanga. 113 M. Stony. 1 Ex.

This remarkable species is characterised by:

(1) a long, slender, rigid, sterile stalk suggestive of a Siphonogorgid rather than a Nephthyid. This stalk is traversed by numerous canals (at least ten);
(2) the fact that the polyps are restricted to the apex, where they form either one or more definite clusters;
(3) the short polyp stalks (about 1 mm.);

(4) the narrow but strong supporting bundle, composed of a few very long curved spindles (2—3 mm.), not projecting or only slightly;

(5) the characteristic anthocodial armature. Each point consists of one or two pairs of bent spindles, markedly projecting in the contracted polyps. At the base of the points there is a pseudo-crown, often of two rows. Small spicules occur between the points.

One specimen from Station 305 has a long, thin, rigid stalk about 13 cm. in height, with an almost uniform diameter of 2.5 mm. The base of the stalk is expanded irregularly. At the top the stalk divides into three short main branches, each of which divides into two. The total length of a branch and branchlet is about 1 cm. The general appearance is suggestive of a capitulum. The armature of the anthocodiæ consists of a pseudo-crown of two rows and eight points of one or two pairs of spindles en chevron. The general colour is whitish. The spicules are colourless.

Another colony, quite evidently a young form, from Station 260, growing on a piece of Polyzoon, is just beginning to branch. The total height of the colony is about 1 cm., of which the stalk is about 3 mm. The breadth of the base is 2 mm.

7. *Stereonephthya sierra* n. sp.

Stat. 273. Jedan Island. 1 Ex.

A somewhat stiff though not rigid colony, markedly flattened in one plane. It consists of a flaccid sterile stalk 4 cm. long. At the top several small branches arise, but the expanded stalk is quite distinct for another 4 cm. At this level two large lateral branches arise and the stalk is continued upwards for another 4 cm. considerably flattened and polyp-bearing. The total height of the colony is 12 cm. and its maximum breadth 9.5 cm.

From the central portion of the polyparium, as well as from the branches, small blunt digitiform processes are given off. On the branches themselves, as well as on the digitiform processes, the polyps are borne, either singly or in more or less horizontal groups of 3—7, like interrupted whorls.

The polyps arise at an angle of about 45° and are directed upwards. The stalk is short (not over 1 mm.) and consists entirely of a strong triangular supporting bundle. The bases of several adjacent supporting bundles may unite in horizontal ridge-like groups, giving the appearance of interrupted whorls. The supporting bundle consists of from 4—6 short thick spindles arranged in an almost equilateral triangle. The uppermost pair project for a short distance and this results in a series of sierra-like ridges.

The anthocodiæ lie in the angle formed by the supporting bundle and the stem, and in many cases appear as if they arose directly from the stem. They are very densely armoured and are completely encased in short thick spindles arranged in eight groups of three or four pairs. Each number is almost equally common on the colony. There is no marked specialisation or projection of the uppermost pair. The colour of the main stem and the larger branches is a greyish yellow, but in the smaller branches it is a dull white. The tips of the projecting spicules in the supporting bundle are pink to reddish; the spicules of the anthocodiæ are red but their tips are often whitish. The sterile stalk (and also the main stem) is distinctly arenaceous

in appearance, due to small globular and capstan-like spicules. At the point of origin of the branches these forms are mixed with short, thick, warty spindles. The latter increase in number and the former diminish so that in the terminal portion of the branches and the processes there are only spindles, irregularly arranged.

The spicules of the sterile stalk consist of (*a*) small simple capstans which apparently give rise to more warty capstans which develop into warty dumb-bells. The constriction in these dumb-bells is in some cases so reduced that an almost warty spheroid form results. These obviously form a developmental series. The other stalk spicules are (*b*) very warty short, thick, curved spindles with the warts more developed on the convex side, (*c*) short, thick, stumpy, warty pseudo-clubs, and (*d*) a few longer, narrower, less warty spindles.

8. *Stereonephthya spicata* n. sp.

Stat. 50. Bay of Badjo, West coast of Flores. Up to 40 M. Mud, sand and shells, according to locality. 2 Ex. Another from Stat. 164.
Stat. 303. Haingsisi, Samau-island. Up to 36 M. Lithothamnion-bottom. 1 Ex.

Several flabby colonies of a dirty white colour agree in many respects with WHITELEGGE's *Spongodes pallida*, and more with it than with KÜKENTHAL's *Stereonephthya whiteleggi* which he identified with WHITELEGGE's species.

Our chief reason for separating it off from both, if they are distinct, is the strength of the supporting bundle which WHITELEGGE does not mention or figure, which KÜKENTHAL calls "slightly developed".

On the lower parts of the colony the polyps occur singly, but elsewhere they are for the most part in groups of varying numbers.

The polyp stalk is about 1.5 mm. long, and the polyp is usually bent down sharply on the stalk. The supporting bundle is strong and usually one spicule projects distinctly.

The anthocodial armature is very distinctive and simple, consisting, as it does, of 2 converging hockey-club-like spindles in each of the eight points, one of the two being much the stronger.

These points are based in a number of sometimes sloping, sometimes horizontal, spindles which pass imperceptibly into those of the polyp stalk. All grades can be found between polyps showing no transversals and others with 3 or 4 rows; but in all cases our interpretation is the same, that the basally disposed spindles are not so much anthocodial as pertaining to the polyp stalk.

What catches the eye at once is the prominence of the tips of the eight anthocodial points and the strongly projecting tip of the supporting bundle. The spicules of the sterile stalk are straight or curved warty spindles. This new species agrees with *Spongodes pallida* Whitelegge in having a pair of converging spicules in each anthocodial point, one longer than the other, and in showing at the base of these a number of transverse rows. WHITELEGGE, however, does not mention or figure a supporting bundle. For this reason it does not seem to us possible to merge our specimens into *Spongodes pallida*.

KÜKENTHAL not very convincingly maintained that WHITELEGGE's *Spongodes pallida* was a Stereonephthya, and identified it with his *Stereonephthya whiteleggi*. It is impossible to refer

our specimens to this species on account of the strength of the supporting bundle, and the fact that the anthocodial points consist of a single pair and not of four pairs of spindles.

9. *Stereonephthya ulicoides* n. sp.

Station. Not recorded. 2 Ex.

This new species has been established for two complete colonies and several fragments. From an encrusting base there arise a number of radiating branches each of which gives off finger shaped *Araucaria*-like lobes. All the lobes arise almost vertically, so that they lie approximately parallel. They are densely covered with polyps, so that little of the naked cortex is seen.

The polyps have short stalks. The supporting bundle arises directly from the lobe and the anthocodiæ hang down at an acute angle like the flowers of a *Campanula*. The supporting bundle is strong and consists of a median dorsal ridge of three or four spindles flanked on each side by three or four laterals. The whole forms a very rigid buttress. Sometimes the three or four of the median ridge project, but most commonly only two. Five of the points of the anthocodiæ are represented, but the en chevron rows are very indefinite; the three ventral points are rudimentary or absent. Between the tips of the points there are a number of intermediate spicules. These spicules are white and strongly refractive. They are arranged in small groups which stand out as white lobes. The tentacles are heavily armoured with a double row of short spicules which are linked up with the intermediates.

The points are made up of from five to eight pairs, but six is the most common number.

In some respects this species comes near *S. ulex*, but the branches cannot be described as "very rigid" or Madrepore-like. They are well armoured but not rigid. The polyps are also more closely arranged on the lobes than in *S. ulex*.

Genus **Siphonogorgia.**

The genus Siphonogorgia was established by KÖLLIKER in 1874 for *Siphonogorgia godefroyi*, n. g. et sp., which he regarded as intermediate between Alcyonidæ and Gorgonidæ (Briareinæ in particular). But this was before the clear contrast was drawn between Pseudaxonia, where the axis is really coenenchymal, and Axifera, in which the axis is invested by the coenenchyma.

The points of KÖLLIKER's diagnosis were:

(1) that the coenenchyma is hard and includes much connective tissue with many needles;
(2) that the polyps occur only on the ends of the smallest branches, and are retractile into slightly projecting calyces;
(3) that the coelentera are continued into canals, which penetrate the whole interior of the colony, inside both twigs and stem;
(4) that only four mesenteries are continued into the elongated coelentera, namely those that bear the gonads and the long narrow mesenteric filaments;
(5) that the polyp-calyces have slightly developed opercula.

WRIGHT and STUDER (1889) widened the conception of KÖLLIKER's sub-family, Siphonogorgiaceæ, so as to include all the Nephthyidæ that have abundant spicules in the partition

walls of the stem-canals. They recognised four genera: 1. Paranephthya; 2. Scleronephthya; 3. Chironephthya; and 4. Siphonogorgia.

1. As regards the genus Paranephthya, it stands markedly by itself, in having non-retractile polyps, tentacles folded over the mouth when at rest, peculiar foliaceous and spiny clubs, and a distinctive dusty or scaly appearance when the surface is dry. Its position among the Siphonogorginæ seems to require fresh inquiry. Thus *Paranephthya capitulifera* W. and S., should be referred, as KÜKENTHAL noticed, to the genus Capnella among the Nephthyidæ.

2. As regards the genus Scleronephthya, established by WRIGHT and STUDER, it is much nearer the Siphonogorgia type, having large spiny spindles and distinct "crown and points". The canals, however, are absent from the centre of the stem, which forms an irregular axis. The shape and armature of the polyps come near to what is seen in Nephthya, and the bushy appearance of the ends of the branches is like Dendronephthya (or Spongodes) rather than Siphonogorgia. There is no trace of supporting bundles, and the tough compact consistence of stem and branches, whose walls do not collapse either in spirit or in the dry condition, distinguishes the genus from the true Spongodinæ.

3. and 4. WRIGHT and STUDER separated off the new genus Chironephthya from Siphonogorgia, mainly on the ground that "the polyps occur along the entire course of the branches and are less retractile".

The criticisms of KÜKENTHAL and of HICKSON seem to render this separation quite untenable. HICKSON sums up the contrasts as follows:

"I would suggest that the name Chironephthya be retained for the species or facies with a form and mode of branching resembling that of the genus Nephthya, with anthocodiæ rarely completely retracted in preserved specimens, and with four principal spicules arranged in chevron, in the points of the anthocodiæ; and that the name Siphonogorgia be retained for species or facies of more massive Gorgonia-like form of growth, with anthocodiæ capable of complete retraction within the general coenenchyma, and with spicules irregularly placed, or arranged in a fan-like manner in the points of the anthocodiæ".

But he proceeds to point out that a given specimen may be in some of its characters Siphonogorgia-like and in others Chironephthya-like.

Many species that have been referred to the genus Siphonogorgia have anthocodiæ completely retracted, and in most cases the spicules of the points are arranged in chevron, as in *S. annectens*, *S. cylindrata*, etc., though sometimes with two pairs of principal spicules, as in *S. köllikeri*.

The difference in the thickness of the canal walls cannot be considered as diagnostic, as some species have walls of medium thickness and might be placed midway between the two types. In *S. godefroyi* there is a very thick, rigid, outer wall, and the canals in the centre are separated by thin partitions.

It is therefore probable that all species of Siphonogorgia and Chironephthya should be included under the older name Siphonogorgia with the following characteristics:

(1) colony rigid, upright, ramified;

(2) coenenchymal tissue consisting of irregularly arranged spicules, with connective tissue between, and no distinct cortex;

(3) polyps arising anywhere on the stem and branches;
(4) polyps included in a verruca or calyx, which is a wart-like or cup-shaped projection of spicules from the general coenenchyma; polyps consist of a non-protrusible portion, and of a protrusible anthocodial portion, which may or may not be retracted within the verruca;
(5) armature of the anthocodia consisting of (*a*) a crown or collaret, with a varying number of rows of small, bent, horizontal spicules; (*b*) eight points surrounding the base of the tentacles, with a varying number of spicules, arranged in different ways, but always converging at the apex;
(6) tentacles folded over the mouth and armed dorsally with minute spindles;
(7) digestive cavities canal-like and elongated, penetrating the entire stock, in the twigs, the branches, and the main stem;
(8) partition walls bounding digestive canals, rigid, filled with spicules;
(9) only four of the polyp-septa enter into the elongated gastral cavities, namely those which bear the gonads and the long narrow mesenterial ridges;
(10) germ-cells contained within the elongated gastral tubes of the smallest branches.

To the four genera of the family Siphonogorginæ, recognised by Wright and Studer, there have since been added: 5. Lemnalia; 6. Stereacanthia; 7. Agaricoides; and 8. Cactogorgia.

5. As regards the genus Lemnalia Gray, emend. Bourne, it must be noted that the whole colony is flaccid, not stiff, that the stem and branches look smooth to the naked eye, and that the numerous spicules on the canal walls are small and delicate, not in the least like those of a Siphonogorgia. Double four-rayed stars often occur in the outer wall of the stem, and scale-like, flattened, branched spicules are typically present on the tentacles. The stalked or sessile anthocodiæ cannot be retracted, but the tentacles can be tightly folded over the wide oral disc.

6. As regards the genus Stereacanthia Thomson and Henderson, the canal walls are thickly packed with large heavy spindles, the anthocodial armature shows eight irregular triangles or "points" rising from an indistinct transverse collaret or "crown"; and the spicules are of the Siphonogorgia type. The separation of Stereacanthia from Siphonogorgia is justified on the following grounds:

(1) The polyps are borne on stalks.
(2) There is an external resemblance to some species of Eunephthya.
(3) Great irregularity occurs in the triangles of the points.
(4) There is an absence of any definite separation between the irregular collaret and the spicules of the stalk.

7. The unique genus Agaricoides Simpson, placed among Siphonogorgidæ on account of the thick feltwork of internal stem spicules, stands quite by itself on account of the pedicelled anthocodiæ. The biserial arrangement of the spicules of the points is continued down to the origin of the stalk. No crown or collaret is present. The spicules are long, slender, warty, and spiny spindles as in Siphonogorgia; and verrucæ are present, into which the anthocodiæ can be retracted.

8. As regards Cactogorgia, a distinctive feature that leaps to the eye is the origin of the polyps from the margin of the flattened lobes, coupled with the absence of branching.

Cactogorgia is more densely spiculose, firmer, and more rigid than Siphonogorgia; but it resembles that genus in (*a*) the complete retractility of the anthocodiæ within prominent verrucæ, (*b*) the definite "crown and point" arrangement of the spicules on the anthocodiæ, and (*c*) the spindle shape of the spicules, except on the tentacles, where they are flat and scale-like.

9. As to the peculiar genus Dactylonephthya Thomson and Henderson, it seems nearer Alcyonidæ than Siphonogorgidæ, and its separation off from the latter is indicated by the absence of distinct verrucæ or anthocodiæ. It was included amongst the Siphonogorgiaceæ owing to the presence of large spindle-shaped spicules in the canal walls. These, however, are not *extremely* numerous.

Thus the genera of the sub-family stand as follows:

Siphonogorgia, *Chironephthya* } Dubiously separable; in our opinion, *not* separable.

Paranephthya. Markedly distinguished by foliaceous spicules, and scaly appearance when dried; in part = Capnella (Nephthyidæ).

Scleronephthya. Externally resembling Dendronephthya, with hints of an irregular axis.

Lemnalia. Lacking the Siphonogorgia rigidity, with numerous delicate spicules in the canal walls.

Stereacanthia. Externally resembling some species of Eunephthya, with stalked polyps, and no definite separation between crown and stalk.

Agaricoides. Quite unique in its pedicelled anthocodiæ, with octagonal disc-like expansions.

Cactogorgia. With polyps borne mainly on the margins of flattened, rigid lobes.

Criticism of Specific Characters.

In distinguishing species of Siphonogorgia it seems quite clear that there are many differences of little specific importance.

(*a*) Little importance can be attached to colour.

Thus, among eight specimens of *S. variabilis* described by Thomson and Henderson 1909, the following combinations of colours occured: (1) White to greyish; polyps white. (2) Pale brown merging into purplish-red; polyps bright yellow. (3) Yellow; polyps yellow. (4) White merging into dull red in the branches; polyps white. (5) Yellow; polyps bright red. (6) Creamy-white; polyps bright red. (7) Brown; polyps dark red. (8) Sulphur yellow; polyps red.

Again the colours of the general coenenchyma of three specimens of *S. mirabilis* are described by Thomson and Henderson as being, (1) creamy-white, (2) red, and (3) almost coral-red, merging into orange red towards the apex. A specimen from the Siboga expedition is coral red, but merges into creamy white at the ends of the branches and on the verrucae. At the same time there are cases of a constant colour-scheme so far as is at present known.

(*b*) Little importance can be attached to the size of spicules, except where they are markedly larger than is usual, as in *S. macrospina*, *S. macrospiculata*, and *S. media*; or markedly smaller than is usual, as in *S. mirabilis*.

The proportion of length to breadth may however be diagnostic, where the general Siphonogorgia type of slender spindles is deviated from, as in *S. mirabilis*, where the spicules are almost as broad as long.

(*c*) The mode of growth is within certain limits of some diagnostic value.

Much branched forms must of course be noted, as also unbranched. Similarly anything markedly peculiar in the mode of branching, such as the constant down-drooping of the branches, seen in *S. pendula*, or the stout digitate processes of *S. annectens*, is of importance as a specific character.

The actual number of branches and secondary branches, with a detailed measurement of their length, and of the distance of their origin from the base of the colony, seems to be of no great importance.

(*d*) The number of canals present and also their position in the stem appear to be very variable. The nature of the walls, however, is a constant and definite character for a given species.

(*e*). The "fan-like" or "chevron" pattern of the points is unimportant.

Both types have been found on the same specimen by THOMSON and HENDERSON, 1909. No example of fan-like arrangement has occurred in any of the twenty-three species of Siphonogorgia or Chironephthya examined from the collection of the Siboga Expedition.

DESCRIPTION OF SPECIES.

The following descriptions of species take account of (1) the nature of the anthocodial armature; (2) the nature of the verrucae, whether prominent or slightly developed, whether with a clear supporting bundle or not; (3) the degree of retractility exhibited by the polyps; (4) the character of the canals in the stem, whether large and irregular with relatively thin collapsible walls, or small and circular with very thick hard walls; (5) any unusual and distinctive feature of the spiculation, such as illustrated by *S. obspiculata* Chalmers, and (6) any distinctive feature in the general mode of growth or in the coloration.

LIST OF PREVIOUSLY DESCRIBED SPECIES WITH THEIR DIAGNOSTIC CHARACTERS.

The arrangement is alphabetical.

1. *Siphonogorgia annectens* Thomson and Simpson, 1909.

(1) Crown — about 5 rows of spicules.
Points — 5—8 spicules arranged somewhat irregularly en chevron.
(2) Verrucae very prominent, with openings directed upwards; closely set, so that the top of one is on the same level as the base of the next above it.
(3) Anthocodiæ wholly retractile.
(4) Interior of stalk soft with few spicules; canal walls thick with distinctly gelatinous mesogloea.
(5) Spicules bright red, often S-shaped, somewhat stout, with small compound warts closely packed.
(6) Branching consists of stout digitiform processes.
Colour — dull red.
Locality: Puri Orissa Coast.

2. *Siphonogorgia annulata* (= *Chironephthya annulata* Harrison (1908)).

(1) Crown — about 6 rows of spicules.
Points — 3–5 spicules irregularly arranged en chevron, one generally larger than the others.

(2—5) Not described.
(6) Short thick branches given off all round the stem.
Colour — deep crimson shaded to buff yellow.
Locality: Admiralty Island.

3. *Siphonogorgia asperula* Thomson and Simpson, 1909.

(1) Crown 3—6 rows of large spindles with a few rows of smaller ones in the oesophageal region.
Points — 2 very strong spindles bent at the base with one or two small ones between.
(2) Slightly projecting verrucae, composed of a few large longitudinal spicules. In some cases unsymmetrical cylinders are strengthened externally by two sheaves like "supporting bundles".
(3) Polyps unretracted.
(4) Numerous canals in the stem with very thin partition walls.
(5) Stout and slender spicules with large warts.
(6) Massive with numerous short branches, verrucæ mainly on short branches and tip of stem.
Localities: Cape Comorin, Andamans.

4. *Siphonogorgia collaris* Nutting, 1908.

(1) Crown — broad and conspicuous.
Points — a few spicules arranged en chevron, and then a few longer and more slender spicules, which are outside of the latter and curved to meet each other, so that their distal ends are parallel to the axis of the tentacle; the whole forming a high operculum.
(2) Verrucæ prominent (3.5 mm. high), tubular, narrowing gradually at the distal end.
(3) Anthocodiæ retracted.
(4) Canals numerous and irregular with long and minute spindles in their walls.
(5) Spicules densely covered with minute tubercles, appearing granulated.
(6) Polyps thickly clustered over the entire surface (only a fragment was secured).
Locality: Off Laysan Island.
Note. *S. collaris* differs from *S. köllikeri* in having much more exserted and more crowded calyces.

5. *Siphonogorgia crassa* (= *Chironephthya crassa* Wright and Studer, 1889).

(1) Not described.
(2) Verrucae large, and obliquely projecting.
(3) Polyps more or less retracted.
(4) Canals wide, bounded by thin walls.
Locality: Hyalonema Ground, Japan.
Note. No details of the anthocodial armature were given by Wright and Studer, but Hickson, having examined the type specimens in the British Museum, (The Alcyonaria of the Maldives, 1903), is convinced that the species *S. dipsacea*, *S. crassa*, *S. scoparia* are one and the same thing, and also identical with *S. variabilis* (Hickson). In this case, the crown consists of about 10 rows, and the points have 4 main spicules arranged en chevron with smaller

ones between. According to WRIGHT and STUDER, *S. crassa* has not the same rigid consistency as *S. scoparia* and *S. dipsacea*.

6. *Siphonogorgia cylindrata* Kükenthal, 1896.

(1) Not described.
(2) Verrucæ prominent, broad warty structures of converging spicules, mostly s-shaped, often as large as 2 mm.
(3) Anthocodiæ completely retracted.
(4) Canals very narrow in the main stem.
(5) Spicules of coenenchyma large (3.7 × 0.4 mm.), thickly beset with small round warts. Masses of very small spicules with small warts occur in the inside of the stem (0.5 × 0.03 mm.)
(6) Branches and stem quite cylindrical, very rigid and brittle.
Colour, yellow ochre, with lighter polyps.
Locality: Ternate.

7. *Siphonogorgia dipsacea* Wright and Studer, 1889.

(1) Not described.
(2) Verrucae appressed to the stem, do not rise up sharply from the coenenchyma.
(3) Polyps unretracted.
(4) Canal walls thin, gradually increasing in width from the top of the colony to the base.
(5) Spicules of stem and branches somewhat blunted at both ends and thickly surrounded with blunt vertical warts.
(6) Branches stiff and fingerlike, tapering to the ends. Very little secondary branching. Long barren stem.
Colour, yellow to reddish yellow, with purple polyps.
Locality: Hyalonema Ground, Japan.
Note. See *S. crassa*.

8. *Siphonogorgia dofleini* Kükenthal, 1906.

(1) Crown — 12 rows of spicules.
Points — sometimes as many as 4 pairs en chevron.
(2) Verrucae formed of broad bundles of strong spindle-shaped spicules, some of which reach to the top of the anthocodiæ.
(3) Anthocodiæ not wholly retracted.
(4) A few large canals with thin walls.
(5) Typical Siphonogorgia spindles, stout for the most part, with small slender ones in the canal walls. Large and small warts occur.
(6) Colour, reddish — violet—orange, with grey-green polyps.
Locality: Idzu, Japan.
Note. Differs from *S. variabilis* mainly in the heavier armature of the polyp.

9. *Siphonogorgia duriuscula* Thomson and Simpson, 1909.

(1) Anthocodial armature very distinct.
Crown — 4—6 rows of curved spindles.
Points — 2 pairs en chevron.
(2) Verrucae occur all round, formed of about eight spicules which give an irregular toothed opening. They are all directed upwards and more developed externally.
(3) Anthocodiæ not retracted.
(4) Numerous canals in the stem, with thin walls.
(5) Spicules rather elliptical, covered with very large, close-set, compound warts.
(6) Small massive colony with lobate branches.
Colour — general coenenchyma yellowish-pink, crown and points dark crimson red.
Locality: Cape Comorin.

10. *Siphonogorgia flavocapitata* (= *Chironephthya flavocapitata* Harrison, 1908).

See THOMSON and RUSSELL, 1910.

(1) Crown — 6 rows of spicules.
Points — 2 large spicules and smaller ones irregularly disposed between them.
(2) Verrucae directed vertically upwards.
(3) Anthocodiæ not retracted.
(4, 5) Not described.
(6) Long slender branches, slightly subdivided, tending to droop downwards.
Colour — Pure white, with a few pink spicules in the stem and branches. Polyps deep orange.
Localities: Admiralty Islands, Providence, Amirante.

11. *Siphonogorgia godeffroyi* Kölliker, 1874.

(1) Not described.
(2) Cup-shaped verrucæ.
(3) Retracted anthocodiæ, verrucæ slightly open at the ends, so that in some cases the polyp can be seen.
(4) The centre of the stem is greyish-white and gelatinous, intersected by canals of which the largest is in the middle. The walls are like gristle and have a certain number of spicules in them. To the outside the rind is red and hard, very rich in spicules. In the smaller branches more and more of the stem becomes filled up with wider canals whose walls are richer in spicules.
(5) Some of the spicules may be over 4 mm. in length. Between the canal walls are small very red spicules, 0.1—0.15 mm. in length.
(6) The ends of the branches club-shaped. Polyps only on the thickened ends of tertiary branches.
Colour — dark brownish-red with yellow polyps.
Localities: Pelew Islands, Hyalonema Ground Japan, Funafuti.

12. *Siphonogorgia gracilis* (= *Chironephthya gracilis* Harrison, 1908).

(1) Crown — 5 rows of spicules.
Points — 3—5 spicules en chevron, larger than those of the crown and with more pronounced warts.
(2) Not described.
(3) Anthocodiæ unretracted.
(4, 5) Not described.
(6) Branches short and slender. Polyps sessile and single on main stem branches, in groups and generally on short stalks on terminal twigs.
Colour — stem and branches deep red, polyps orange yellow.
Locality: Admiralty Islands.

13. *Siphonogorgia harrisoni* Thomson and Russell, 1910.

(1) Crown — 6 rows of spicules.
Points — 3—4 convergent pairs of spicules.
(2) Verrucae distinctly spirally arranged, from 2—3 mm. apart.
(3) Anthocodiæ retractile.
(4) Strong development of spicules in canal walls gives the stem a compact resistant character.
(5) Pale yellow-brown spindles, with prominent tuberculate warts.
(6) Branches terminate bluntly. Swollen appearance of the tip, due to the crowding together of 5 or 6 polyps. Stem perfectly cylindrical, branches compressed and deeply furrowed.
Locality: Providence.

14. *Siphonogorgia hicksoni* Thomson and Russell, 1910.

(1) Crown — at least 10 rows of spicules.
Points — 3—4 short red spicules, lying more or less parallel. Occasionally one spicule may dominate or two may converge. One or two smaller spicules between these main groups. The tentacle spicules are very conspicuous, being a bright lemon-yellow colour, while the other polyp spicules are dull maroon-red.
(2) Verrucae arranged in wide spirals, ending in 3—4 at the tip of the branch, more strongly developed on the side away from the branch, so that the polyps face directly upwards. Outer spicules frequently project beyond the polyp base as a distinct point.
(3) Anthocodiæ unretracted.
(4) Not described.
(5) Long, slender, crimson-red spicules, with comparatively simple warts.
(6) Stem, at first cylindrical, becomes broad, flattened and furrowed where the branches begin. Branches often pendulous at the tips. Polyps only on the branches.
Locality: Providence.
Note. This species is near *S. mirabilis* and *S. miniacea*.

15. *Siphonogorgia hicksoni* (= *Chironephthya hicksoni* Harrison, 1908).

(1) Crown — about 5 rows of spicules.
Points — 2 or 3 spicules en chevron, and smaller ones irregularly disposed between them.
(2) Not described.
(3) Anthocodiæ not retractile.
(4, 5) Not described.
(6) Very slight branching. Branches short and thick. Polyps more numerous on the terminal twigs.
Colour — uniform dull yellow, but with a deep purple in the tentacles.
Locality: Admiralty Islands.

16. *Siphonogorgia indica* (= *Chironephthya indica* Thomson, 1905).

(1) Crown — 5 rows of spicules.
Points — 3 pairs of spicules en chevron, the two outermost enclosing the others.
(2) Scarcely any verrucae, anthocodiæ nearly flush with the general surface of the branch.
(3) Anthocodiæ almost completely retracted.
(4) 4 canals seen in cross-section.
(5) Large rough spicules, mostly curved in a slightly s-shaped manner, reddish-brown and light-brown in colour. Slender small spicules also occur, very small colourless ones with long spines occur in the canal walls.
Locality: Ceylon Seas.

17. *Siphonogorgia intermedia* Thomson and Henderson, 1906.

(1) Crown — about 3 rows.
Points — 4—5 distinct pairs diverging into a brush-like apex.
(2) Not described.
(3) Some of the polyps well expanded, others all but completely retracted into the coenenchyma.
(4) Not described.
(5) Cortical spicules slender, with a few rough warts, the inner spicules of the stem strong and closely covered with warts. Some of the spicules bifid, or slightly branched at one end.
(6) Four finger-shaped lobes on a short trunk, a few relatively distant polyps all round each lobe.
Colour — cream.
Locality: Zanzibar shore.
Note. Quite unlike other known forms of Siphonogorgia, but with well-developed anthocodial armature, and walls of stem canals supported by numerous spicules.

18. *Siphonogorgia köllikeri* Wright and Studer, 1889.

(1) Crown — not described.
Points — 4—6 converging spicules.
(2) Verrucæ prominent, large, blunt, cone-shaped, standing at an acute angle to the branch.
(3) Anthocodiæ retracted.

(4) The branches have a few large canals separated by thin walls. The stem has smaller canals in larger numbers, separated by thick walls of mesogloea in which small spicules are imbedded.
(5) Spicules of coenenchyma long, stout, warty, with rounded ends, orange to yellow in colour, visible at once to the naked eye. Smaller spicules in the walls between the canals.
(6) Stem and branches somewhat flattened.
Colour — coral-red with white anthocodiæ.
Note: Thomson and Russell, 1910. Var. *rugosa*.
(1) More massive than *S. köllikeri* Wr. and St.
(2) Polyps project more conspicuously.
(3) Anthocodiæ the same.
(4) Spicules longer and more slender; warts smaller, simpler and more scattered. Colour vermilion with occasional crimson tinge, instead of strong orange to yellow. Spicules sparser on the stem and more irregular.
Localities: Providence, Amirante.

19. *Siphonogorgia macrospiculata*
(= *Chironephthya macrospiculata* Thomson and Henderson, 1906).

(1) Crown — 3—4 rows of spicules.
Points — 2 principal spicules slightly inclined to one another and 2 smaller ones in the angle between. There may be 4 large ones.
(2) Small platform-shaped verrucæ formed by several spicules placed side by side, at an acute angle to the branch.
(3) Anthocodiæ may be retracted, but not always.
(4) Not described.
(5) Spicules red or colourless, may reach over 8 mm. in length.
(6) Singularly rough surface owing to the presence of large white spicules, the interstices between them being filled up with smaller red or colourless ones.
Colour — light or reddish brown with a streaky appearance.
Localities: Indian ocean, Malabar Coast, Salomon.

20. *Siphonogorgia macrospina* Whitelegge, 1897.

(1) Crown — several rows.
Points — 6—8 spicules en chevron.
(2) Verrucae rudimentary, more of a projecting ledge than a distinct cup. The anthocodiæ thus appears to arise obliquely from the support.
(3) Anthocodiæ not wholly retracted.
(4) Walls of canals thickly charged with long thin spiny rods and spindles.
(5) Spicules on twigs very long, up to 6 mm. in length, those on the main stem stout and short. They are covered, in some cases, with large warts close together, and in others with spines.

(6) Hard, slightly flexible, but rather brittle, owing to the large spicules and the paucity of the coenenchyma. Branches arise almost at right angles. In the smaller twigs, a long spindle may be curved round the verruca, so that the polyp is protected within a small sinus.
Colour — orange yellow-brown with brown polyps.
Locality: Funafuti, Caspar Strait.

21. *Siphonogorgia media* Thomson and Simpson, 1909.

(1) Crown and points arrangement very marked.
Crown — about 12 rows, which diminish in size as they pass down the neck.
Points — 2 very definite club-shaped spicules, touching almost throughout their entire length, having a curved spindle as a base to the triangle. The small triangle encloses a single spicule.
(2) Verrucae rather prominent, formed by a definite arrangement of large longitudinally disposed spicules.
(3) Anthocodiæ retractile.
(4) Not described.
(5) Spindles very large, 4.75 mm. in length, covered with multituberculate warts.
(6) Branches arise perpendicularly from the main stem. The whole colony is stiff and rigid.
Colour — creamy-white, slightly pinkish near the base.
Locality: Andamans.

22. *Siphonogorgia miniacea* Kükenthal, 1896.

(1) Crown — 4 rows of spicules.
Points — 3 spicules on one side and 2 on the other, converging at the top.
(2) Verrucae not very marked, outermost spicules largest, up to 2 mm. Sometimes a modified supporting bundle is formed.
(3) Anthocodiæ completely retractile.
(4) 4 rather narrow canals in the main stem, with thick walls.
(5) In the inside of the stem, thick spicules occur (1×1.8 mm.), with round toothed warts, and also small thin thorny spicules (0.2 mm. in length). The majority of the coenenchyma spicules are of the commonest Siphonogorgia shape (1.3×0.14 mm., etc.).
(6) Branches cylindrical, scanty.
Colour — coral red, with white polyps.
Localities: Ternate, Ceylon Seas.
Note. The build of the colony is more graceful than that of *S. köllikeri*, the coenenchymal spicules are much larger than those of *S. pallida*, but it is with these two species that *S. miniacea* should be grouped.

23. *Siphonogorgia mirabilis* Klunzinger, 1877.

Crown — (1) 4—6 rows of spicules (Thomson & Simpson, 1909).
(2) 8—10 „ „ „ (Thomson & Russell, 1910).

Points — (1) Fan-shaped with 1 prominent spicule and 4 or 5 smaller ones, on either side (Hickson, 1903).

(2) 6—8 curved spicules, usually forming a point, sometimes fan-shaped (Thomson & Russell, 1910).

(3) 2 large spicules with 1 between, and with smaller ones between the points, or 5 large spicules 2 on one side and 3 on the other directed inwards, or no definite arrangement (Thomson & Simpson, 1909).

(2) Verrucæ usually prominent, composed of spicules with points directed inwards, forming a protection to the polyp.

(3) Anthocodiæ may be retracted but not always.

(4) One large central canal surrounded by smaller ones. Canal walls thick.

(5) Spicules of the main stem usually short and broad, with large warts, and arranged transversely. Those of the smaller branches longer, narrower, more spindle-shaped and disposed longitudinally.

(6) Branching in one plane, main branches cylindrical, smaller twigs not so regular.

Localities: Red Sea, Ternate, The Maldives, N.W. Australia, Providence.

Note. This species requires investigation. The variations in the crown and points appear too great to occur in one species.

24. *Siphonogorgia pallida* Studer, 1889.

(1) Not described.

(2) Well defined verrucæ, somewhat laterally compressed towards the lower portion.

(3) Anthocodiæ entirely retractile.

(4) 4 central canals separated by thin septa.

(5) Spicules of the outer wall large, thick and distinguishable by the naked eye, somewhat blunt at the ends and thickly beset with stout granulated warts. Within the coenenchyma and between the septa long rods and small blunt knobs occur, with spines instead of warts.

(6) Polyps only on the twigs and sub-twigs.

Colour — pale red (spicules purple and white irregularly mingled), polyps white.

Localities: Admiralty Islands, Funafuti.

25. *Siphonogorgia palmata* Thomson & Simpson, 1909.

(1) Anthocodiæ small.

(*a*) Crown — 8—10 rows of spicules.

(*b*) Points — two very large unequal bent spindles, touching on the convex sides for the upper half but diverging at the base. There may be smaller ones between.

(2) Verrucæ, ledge-like and extremely substantial. The ends of the large spicules project at the top, so as to form a shield for the anthocodiæ.

(3) Only in exceptional cases do the verrucæ entirely encircle the polyp.

(4) Not described.

(5) Large spindles.

(6) Branches very thick and lobate, colony stiff and rigid.

Locality: Andamans.

26. *Siphonogorgia pendula* Studer, 1889.

(1) Crown — 8—10 horizontal rows of spicules.
Points — a single pair of convergent spindles.
(2) Verrucae resembling those of Spongodes, attached obliquely to the twig. The spicules of the outer wall project beyond the oral region of the polyp in a spinous fashion.
(3) The anthocodiæ cannot be wholly retracted into the verruca, but are shielded by the protecting bundle of spicules.
(4) Canal walls thick with spicules.
(5) Spicules of outer layers covered with warts ending in delicate spines. Spicules may be dark purplish red, pale rose or white.
(6) Twigs bent towards the base of the stem. Naked main axis round, polyp-bearing branches grooved. Branches arising at an angle of 30°—40°.
Colour — coral-red, with white polyps.

Locality: Bay of Amboina.

Note. Var. *ternatana* Kükenthal, 1896, differs from *S. pendula* Studer, in the following points:
(1) the branches arising at right angles;
(2) the absence of furrows on the branches;
(3) the spicules being longitudinal on the branches, and not irregularly arranged as in *S. pendula*;
(4) the spicules of the branches being bigger than those of the stem;
(5) polyps arising from the main stem;
(6) the presence of spicules in the canal walls three times as large as elsewhere.

Locality: Ternate.

Var. *ramosa* Thomson and Russell, 1910, differs from *S. pendula* (Studer) in (1) its bushy habit; (2) the larger size of the polyps; (3) their heavier and more complex armature, (a third or fourth spindle may be inserted between the angle of the two main large ones of the points); (4) their longer stalks; (5) their different arrangement at the tips of the twigs.

Locality: Providence.

Var. *indica* Harrison, 1908, differs from Studer's specimen in the immense size of the spicules of the partition walls.

It is probably therefore the same variety as Kükenthal's *S. ternatana*.

Locality: Bay of Bengal.

27. *Siphonogorgia planoramosa* (= *Chironephthya planoramosa* Harrison, 1908).

(1) Crown — 8 transverse rows of spicules.
Points — 3—5 spicules en chevron.
(2) Not described.
(3) Anthocodiæ not retractile.
(4) Not described.
(5) Not described.
(6) Branches nearly at right angles to the stem, inclined to bend downwards.
Colour — base of stem rosy purple, rest of colony pure white.

Locality: Admiralty Islands.

28. *Siphonogorgia pustulosa* Studer, 1889.

(1) Not described.
(2) Small low conical verrucae.
(3) Anthocodiæ retracted, but verrucae not always closed over them.
(4) Four central stem canals, separated by thin septa, in which dark red spicules are embedded.
(5) Spicules large and spindle-shaped, and also short and broad, beautiful violet red. They lie irregularly in the stem, longitudinally in the smaller twigs.
(6) Yellow polyp calyces stand out like pustules on the coral red ground of the branches.

Localities: Ben Api (New Hebrides), Ceylon Seas, Admiralty Islands.

Note. Thomson and Simpson (1909) have no doubt as to the merging of Studer's species *S. pustulosa* into Klunzinger's *S. mirabilis*. So far as described, however, *S. pustulosa* has thin-walled canals, while in *S. mirabilis* they are thick-walled.

29. *Siphonogorgia purpurea* (= *Chironephthya purpurea* Harrison, 1908).

(1) Crown — 7 or 8 rows of spicules.
Points — 3 or 4 spicules en chevron. When 4 are present, 1 is on one side and 3 on the other.
(2) Not described.
(3) Polyps not retractile.
(4) Not described.
(5) Not described.
(6) Branches and polyps directed vertically upwards. Secondary branches few and small.
Colour — stem and branches white, becoming cream in the terminal twigs, polyps deep purplish red.

Locality: Admiralty Islands.

30. *Siphonogorgia retractilis* (= *Chironephthya retractilis* Harrison, 1908).

(1) Crown — 5 transverse rows of spicules.
Points — 4 spicules en chevron.
(2) Verrucæ entirely enclose the polyp by all spicules converging in a point, yet not folding over.
(3) Anthocodiæ completely retractile.
(4) Not described.
(5) Not described.
(6) Colour — stem and branches cream, crimson-purple polyps.

Locality: Admiralty Islands.

31. *Siphonogorgia robusta* Thomson and Russell, 1910.

(1) Crown — 6 rows of spicules.
Points — 1 pair of long thorny spindles, bent outwards at the base, in the shape of hockey clubs, with straight tapering handles closely apposed. Between the blunt diverging ends there may be one or two small spindles. Similar small spindles are inserted in parallel groups of 2—3 between the pairs of hockey clubs.

(2) Verrucæ more strongly developed on the outer edge, forming a series of "graptolite"-like projections along the branch.
(3) Anthocodiæ in many cases wholly retracted.
(4) Not described.
(5) The spicules of the coenenchyma are massive, densely covered with large tuberculate warts. The large size of the polyp spicules gives the polyp head a massive appearance. The spicules of the points have closely set warts at the blunt end, becoming sparser and simpler towards the handle.
(6) Branches markedly thick in comparison to the length. Main stem deeply furrowed, and of coarse rough texture.

Localities: Providence, Amirante.

32. *Siphonogorgia rotunda* Harrison, 1908.

(1) Crown — about 6 rows of spicules.
Points — 5 spicules in each, directed vertically upwards; below these 8 spicules en chevron.
(2) Verrucæ at right angles to the stem and branches.
(3) Anthocodiæ almost completely retractile.
(4) Thick-walled canals.
(5) Not described.
(6) Stem and branches solid, smooth and rounded, branching not very great.
Colour — stem and branches flesh-coloured, polyps white.

Locality: Bay of Bengal.

33. *Siphonogorgia scoparia* (= *Chironephthya scoparia* Wright and Studer, 1889).

(1) Not described.
(2) Verrucæ short, laterally appressed and far apart.
(3) Anthocodiæ retracted.
(4) Four wide radially arranged canals, separated by thick rigid walls.
(5) Some of the spicules are large, up to 3.5 mm. in length; they may be pointed at one end and blunt at the other.
(6) Branches stumpy. Consistence of the whole colony brittle and fragile.
Colour — yellowish white.

Locality: Hyalonema ground Japan.

Note. See *S. crassa*.

According to Wright and Studer this species is distinguished from *S. dipsacea* by the stouter and differently arranged spicules in the stem.

34. *Siphonogorgia siphonogorgica* (= *Chironephthya siphonogorgica* Harrison, 1908).

(1) Not described.
(2) Verrucæ can be closed over retracted polyp.
(3) Anthocodiæ completely retractile.

(4) Not described.
(5) Spicules somewhat loosely packed.
(6) Branches few, directed obliquely-upwards, not further subdivided.
Colour — stem bright coral-red, polyps bright yellow.
Locality: Bay of Bengal.

35. *Siphonogorgia splendens* Kükenthal, 1906.

(1) Crown — 3 rows of spindles.
Points — 1—2 pairs; if 2, the outer pair larger. Two small spindles between the points.
(2) Verrucæ not sharply differentiated from the polyp.
(3) Anthocodiæ not retracted.
(4) Not described.
(5) Spicules of verrucæ large, up to 3 mm. in length.
(6) Colour — ivory white, red verrucæ and crowns.
Locality: China Sea.
Note. This species differs from *S. variabilis* in the polyp armature, *S. splendens* has only 3 rows in the crown instead of 10, and has 2 small spicules between the points.

36. *S. squarrosa* Studer, 1878.

(1) Not described.
(2) Verrucæ at the ends of twigs only, 5—6 together.
(3) Anthocodiæ completely retracted.
(4) Not described.
(5) Most of the spicules of the stem and branches are short and broad, white in colour. A few larger ones are red.
(6) The whole colony is hard and brittle.
Colour — white with violet-red verrucæ.
Locality: Western Australia.

37. *Siphonogorgia variabilis* (= *Chironephthya variabilis* Hickson, 1903).

(1) Crown — about 10 rows of spicules.
Points — variable, usually four large and prominent spicules en chevron, the two outer usually larger than the inner. In the angle of chevron others may occur.
(2) Verrucæ often by no means prominent, may consist merely of a few projecting spicules.
(3) Anthocodiæ sometimes retracted, usually not.
(4) Large canals with thin walls.
(5) Size and colour of spicules very variable.
(6) Colour — very variable. Colour of spicules of anthocodiæ usually in marked contrast with those of the coenenchyma.
Localities: The Maldives, Andamans, Persian Gulf, Arakan Coast, Providence, Seychelles, Off Galle, Gulf of Manaar.

Table of the Species of Siphonogorgia taken by the "Siboga Expedition".

SPECIES	No. EXAMINED	LOCALITY — STATIONS	PREVIOUSLY RECORDED FROM
1. *S. annectens* Th. & S.. . .	10	273, 47, 125, 258, 162, 164	Puri Orissa Coast.
2. *S. asperula* Th. & S. . . .	3	204, 257, 164	Cape Comorin, Andamans.
3. *S. cylindrata* Kük. . . .	1	310	Ternate.
4. *S. densa* Chalmers. . . .	2	not recorded	—
5. *S. eminens* Chalmers . . .	2	260	—
6. *S. godeffroyi* Köll. . . .	1	not recorded	Pelew Islands.
7. *S. gracilis* (Harr.)	1	289	Admiralty Islands.
8. *S. grandior* Chalmers . .	3	289	—
9. *S. hicksoni* (Harr.). . . .	1	117	Admiralty Islands.
10. *S. indica* Th.	1	162	Ceylon Seas.
11. *S. köllikeri* Wr. & St. . .	1	274	Bay of Amboina; Off Galle; Funafuti; Providence, Amirante.
12. *S. macrospina* Whitelegge .	1	not recorded	Gaspar Strait.
13. *S. miniacea* Kük.	1	301	Ternate; Ceylon Seas.
14. *S. mirabilis* Klunz. . . .	6	117, 162, 305	Red Sea; N. W. Australia; Ternate, Providence, Maldives.
15. *S. obspiculata* Chalmers . .	5	289, 260	—
16. *S. obtusa* Chalmers . . .	2	310, 144	—
17. *S. palmata* Th. & S.. . .	1	260	Andamans.
18. *S. pauciflora* Chalmers . .	Many small fragments	289	—
19. *S. ramosa* Chalmers . . .	3	310, 204	—
20. *S. rugosa* Chalmers . . .	4	166, 260, 204	—
21. *S. simplex* Chalmers . . .	1	260	—
22. *S. splendens* Kük.	1	310	China Sea.
23. *S. variabilis* (Hick.) . . .	37	310, 257, 305, 274, 289, 277, 220, 164, 204, 260, 117, 306, 294, 60,	Maldives, Andamans, Persian Gulf, Arakan Coast, Providence, Seychelles, Off Galle, Gulf of Manaar.
Total	88		

1. *Siphonogorgia annectens* Th. and S.

For description see: THOMSON and SIMPSON, Account of the Alcyonarians collected by the Royal Marine Survey Ship Investigator in the Indian Ocean, 1909, Part II, p. 134.

Stat. 47. Bay of Bima. 55 M. Mud with patches of fine coral sand. 1 Ex.
Stat. 125. Anchorage off Sawan, Siau-island, 27 M. Stone and some Lithothamnion. 1 Ex.
Stat. 162. Between Loslos and Broken Islands, West Coast of Salawatti; coarse and fine sand with clay and shells. 18 M. 2 Ex.
Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 M. Sand, small stones and shells. 1 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Coral. 1 Ex.
Stat. 273. Anchorage off Pulu Jedan, East coast of Aru-islands (Pearl-banks). 13 M. Sand and shells. 1 Ex.
Non. loc. 1 Ex.

This species is represented by eight specimens readily distinguished by their stout digitiform processes, closely packed verrucæ, and dark red coloration both of coenenchymal and anthocodial spicules. They agree almost completely with the description given by THOMSON and

Simpson, 1909. In every case the spicules in the canal walls are few, but the quantity of gelatinous mesogloea varies considerably, two of the specimens having fairly thin walls.

2. *Siphonogorgia asperula* Th. and S.

For description see: Thomson and Simpson, Account of the Alcyonarians collected by the Royal Marine Survey Ship Investigator in the Indian Ocean, 1909, Part II, p. 136.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.
Stat. 204. Between islands of Wowoni and Buton; Northern entrance of Buton Strait, 75—94 M. Sand with dead shells. 1 Ex.
Stat. 257. In Du-roa-strait, Kei-islands. 52 M. Coral. 1 Ex.

Two specimens occur which are almost identical with Thomson and Simpson's description of *S. asperula*, and one which seems to be related to it, though showing marked variability in the anthocodial armature.

The first two specimens are pinkish yellow in colour, due to the presence of very small red spicules in the canal walls which show between the larger pale yellow spicules of the coenenchyma. The dimensions of these red spicules are 0.15 × 0.02 mm.; they have a few simple pointed warts.

The anthocodiæ, which are massive and not retracted, are armed, as previously described, with a crown of six rows of large spindles, with a few smaller ones in the oesophageal region, and points of two large spindles, bent at the base, with one or two small ones between them. There may also be one or two spicules between the points.

The verrucæ are cup-shaped and support the crown of the anthocodiæ on the tips of unevenly projecting spicules.

There is a far from solid stem, with large canals and thin walls.

The branches are short and massive, and bear the polyps, crowded at the tips.

The third specimen is too fragmentary to name with any certainty. It consists of the broken off end of a branch, with closely packed polyps at the tip. The whole surface has a very rough appearance owing to the extraordinarily loosely packed spicules. The verrucæ are very uneven and jagged and in many cases definite supporting bundles are present. Great variability occurs in the anthocodial armature. The crown is fairly constant and agrees with *S. asperula*, but the points differ considerably, though the prevailing plan appears to be as in *S. asperula*. The differences can for the most part be reduced to differences in the arrangement of the smaller spicules.

The general coenenchyma is grey; red crown and yellow points.

Previously recorded from Cape Comorin and Andamans.

3. *Siphonogorgia cylindrata* Kük. (Plate IV, Fig. 1).

For descriptions see: Kükenthal, Alcyonaceen von Ternate, Nephthyidae Verrill und Siphonogorgidae Kölliker, 1896, p. 138.

Stat. 310. 8°30′ S., 119°7′.5 E. 73 M. Sand, with few pieces of dead coral. 1 Ex.

One good specimen about 15 cm. in height represents this species. The dominant colour is yellowish-white.

The anthocodiæ are armed with 3—4 horizontal rows, and 3—4 pairs of slightly curved spindles en chevron in the points. They are completely retracted within verrucae, which are prominent, but not crowded.

4. *Siphonogorgia densa* Chalmers.

See: CHALMERS, Proc. Roy. Phys. Soc. Vol. XXI, Part 4, p. 165.

Stat. Not marked. 2 Ex.

Two small, stout, dark red colonies, with several branches, short, lobate, and not again sub-divided. These branches are all given off at about the same point near the base and rise together almost vertically.

The crown of the anthocodia is composed of 4—5 rows of red spicules, and the points of one pair of yellow spicules, forming a triangle with the first row of the crown. There may be a single small spicule between these two larger ones. The verrucæ are very crowded, especially near the ends of the branches. They are long and prominent and have their apices pointing upwards. The anthocodiæ are wholly retracted. Several canals, with thin walls, occur in the stem branches.

The majority of the spicules are slender spindles, pale pink to colourless, with narrow prominent warts. A common size is 2×0.2 mm. There also occur, however, a few stouter spicules, with peculiar irregular broadenings and projections at one side.

5. *Siphonogorgia eminens* Chalmers.

See: CHALMERS, Proc. Roy. Phys. Soc. Vol. XXI, Part 4, p. 166.

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.

Four branches, absolutely straight, and without any secondary branching. They are only fragments, and no hint of the mode of growth of the colonies can be obtained from them. Two are red with yellow anthocodiæ, and the other two are red with white anthocodiæ. In each case the anthocodiæ stand out very distinctly, as they are large and entirely unretracted.

The crown of the anthocodia consists of 8 rows of spicules, and the points of 3 pairs of spicules in chevron, sometimes with smaller ones lying at the foot. The verrucæ are large, prominent, and cone-shaped, with spicules converging at the apex, on which the unretracted anthocodia rests. Four large canals with thin walls occupy the whole stem.

The spicules are massive, either all red, or yellow with red centres. The following measurements were taken: 2.5×0.45 mm., 0.9×0.2 mm., 0.4×0.07 mm.

6. *Siphonogorgia godeffroyi* Kölliker.

For description see: KÖLLIKER, Die Pennatulide Umbellula und zwei neue Typen der Alcyonarien, 1874, p. 18.

Stat. Not recorded. 1 Ex.

A portion of the main stem, 2.5 cm. high and 1.5 cm. broad at the base, gives off two very short branches, with club-shaped tips. The ends of these small branches are covered with

yellow-tipped anthocodiæ, which can just be seen appearing through the open ends of the rudimentary cup-shaped verrucæ.

The anthocodial armature consists of a crown of about 6 rows of red spindles, and points with 5 pairs of spicules, arranged so that three are en chevron at the base, and two lie parallel and more or less vertical at the top.

Large stout white spicules, with small compound warts very close together (3.1 × 0.47 mm.), occur in the walls of the canals, along with minute red spicules. The majority of the spicules of the outer wall are slender red spindles with small warts (0.9 × 0.07 mm.).

Previously recorded from Palan Islands.

7. *Siphonogorgia gracilis* (Harrison). (Plate IV, Figs. 2 and 4).

See: HARRISON, Some new Alcyonaria from the Indian and Pacific Oceans, Journ. Linn. Soc. 1908, p. 118.

Stat. 289. 9°0′.3 S., 126°24′.5 E. 112 M. Mud, sand and shells. 1 Ex.

Several very broken, slender, red branches with yellow polyps, mainly at their tips, resemble Miss HARRISON's *S. gracilis* in (1) anthocodial armature, as far as her description goes; (2) the slender branches; (3) the occurrence of the polyps in groups and often on short stalks; (4) the coloration.

Miss HARRISON's description is not full enough to allow of certain identification, but so far as can be seen, her *S. gracilis* is the most nearly related to the present specimen.

The points of note with regard to it are:

(1) The crown consists of 5 rows of spicules, and the points show 2 pairs of slender spicules of which the outer pair are the larger. There may be a smaller one between them.

(2) The verrucæ are few and far between, along the branches, but crowded in groups of four or five at the tips. They are large and cup-shaped and support the crowns of the anthocodiæ, which are for the most part unretracted. A few, however, are completely enclosed by the verrucæ.

(3) There are four large canals, with thin walls.

(4) Most of the spicules are small and slender, red or pink, with prominent compound warts (1.1 × 0.16 mm.). Others occur, pale pink in colour and smaller, with a few simple warts far apart (0.52 × 0.06 mm.).

Previously recorded from the Admiralty Islands.

8. *Siphonogorgia grandior* Chalmers.

See: CHALMERS, Proc. Roy. Phys. Soc., Vol. XXI, Part 4, p. 167.

Stat. 289. 9°0′.3 S., 126°24′.5 E. 112 M. Mud, sand and shells. 3 Ex.

Three tall, narrow, yellow colonies, between 4 and 6 cm. in height, and 4 to 5 mm. broad at the base of the main stem, gradually tapering towards the top. The branching is very slight, one specimen giving off three branches, and the others two each. These branches rise almost perpendicularly, and are not again sub-divided. Polyps occur all over the stem and branches.

The anthocodial armature consists of at least 6 spicules in each point, arranged in converging pairs, and 5—6 rows of spicules in the crown. The anthocodiæ are large and white. The verrucæ are formed by perpendicular spicules, pointing in the same direction as the spicules of the branch and continuous with them. They are very large and entirely enclose the anthocodiæ. Seven equal-sized canals, with very thin walls, occupy the inside of the main stem. The number varies in the branches.

The spicules are large, and easily visible to the naked eye. They are colourless and covered with numerous small warts, usually spiny, though compound tuberculate warts also occur. The following measurements were taken: 4.2 × 0.43 mm., 3 × 0.22 mm., 0.9 × 0.07 mm.

9. *Siphonogorgia hicksoni* (Harrison).

For description see: HARRISON, Some new Alcyonaria from the Indian and Pacific Oceans, Journ. Linn. Soc., 1908, p. 118.

Stat. 117. Kwandang bay-entrance. 80 M. Sand and coral. 1 Ex.

A few very broken pieces of branches appear to be near *S. hicksoni* (Harrison). The material is too fragmentary for a definite statement, only two anthocodiæ being present. These agree in crown and points with Miss HARRISON's description. The broken bits of branches are stout and cylindrical, almost entirely barren of polyps, and the colour is a uniform dull yellow. The verrucæ are large and prominent with jagged uneven spicules overlapping each other at the apex.

Previously recorded from Admiralty Islands.

10. *Siphonogorgia indica* Thomson.

For description see: THOMSON, Appendix to the Report on the Alcyonaria collected by Prof. HERDMAN at Ceylon, 1902. Ceylon Pearl Oyster Fisheries, 1905. Supplementary Reports N° XXVIII, p. 170.

Stat. 162. Between Loslos and Broken-islands, West-coast of Salawatti, 18 M. Coarse and fine sand, with clay and shells. 1 Ex.

One small specimen has a broad, flat, main stem, which divides into two stumpy lobate branches, covered with polyps. There is no further branching. It agrees with THOMSON's description of this species, except in the size of the spicules. These are much broader, measuring in some cases 2.8 × 0.45 mm., in comparison with 2.7 × 0.3 mm., from THOMSON's specimen.

11. *Siphonogorgia köllikeri* Wright and Studer.

For description see: WRIGHT and STUDER, Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873—1876, 1889, p. 236.

Stat. 274. 5° 28'.2 S., 134° 43'.9 E., 57 M. Sand and shells, stones. 1 Ex.

A specimen of this well known species is marked by its large interlocking spindles, with strong compound warts, and its coral red colour.

The anthocodial armature consists of 3—4 rows of spicules in the crown and 2—3 converging pairs in the points.

Previously recorded from Bay of Amboina; off Galle; Funafuti; Providence and Amirante.

12. *Siphonogorgia macrospina* Whitelegge.

For description see: WHITELEGGE, The Alcyonaria of Funafuti, Part I. Australian Museum Memoir III, Part III, 1897, p. 224.

Stat. Not recorded. 1 Ex.

One very damaged specimen agrees with the description of this species of WHITELEGGE's. It is pinkish orange in colour.

Previously recorded from Gaspar Strait.

13. *Siphonogorgia miniacea* Kükenthal.

For description see: KÜKENTHAL, Alcyonaceen von Ternate. Nephthyidae Verrill, und Siphonogorgiidae Kölliker, 1896, p. 136.

Stat. 301. Pepela-bay, East coast of Rotti-island. 22 M. Mud, coral and Lithothamnion. 1 Ex.

A few broken branches appear to be near *S. miniacea* Kük., the only differences being that the anthocodiæ are not retracted, as in KÜKENTHAL's specimen, and the branches are flat instead of cylindrical.

The chief characters of the colony are:

(1) The anthocodial armature consists of 8 points with 4—5 converging spicules, usually arranged with 3 on one side and 2 on the other, and a crown of about 4 rows.

(2) The verrucæ are small and ledge-like, sometimes hardly raised off the branch.

(3) The anthocodiæ are not retracted.

(4) The canal walls are fairly thick in the main stem, thinner in the branches.

(5) Spicules of four types occur.

(*a*) Large red spicules with very prominent compound warts — (2×0.2 mm.).

(*b*) Large red spicules very much slenderer than the former, with simple warts far apart — (1.5×0.1 mm.).

(*c*) Very small red spicules, of which there are many, with a few prominent simple warts — (0.15×0.02 mm.).

(*d*) Small colourless spicules of the anthocodiæ, usually bent.

(6) The branches and main stem are all slender and covered with polyps. The main stem is cylindrical and the branches very much flattened.

Colour — brownish-red with white-lemon anthocodiæ.

Previously recorded from Ternate and Ceylon Seas.

14. *Siphonogorgia mirabilis* Klunz. (Plate IV, Figs. 6 and 7).

For description see: KLUNZINGER, Die Korallthiere des Rothen Meeres, Part I, 1877, p. 49.

Stat. 117. Kwandang bay-entrance. 80 M. Sand and coral. 4 Ex.

Stat. 162. Between Loslos and Broken Islands, West Coast of Salawatti; coarse and fine sand with clay and shells. 18 M. 1 Ex.

Stat. 305. Midchannel in Solor-strait off Kampong Menanga. Stony. 113 M. 1 Ex.

Four specimens from Station 117, one from Station 162 and one from Station 305 have the same characteristic pustuled appearance, hard stems and branches packed with spicules, and are branched in one plane.

(*a*) A beautiful large red colony, with white verrucæ and white tips to the branches. The anthocodiæ are all retracted.

Anthocodial armature.

Crown — 4—5 rows of spicules.

Points — 1 pair of principal spicules with sometimes a smaller one between.

Spicules (1) Short and stout spindles of main stem, pink in colour with very large jagged warts (0.6 × 0.2 mm.).

(2) Large, colourless, pointed spindles of branches, with medium warts, 1.3 × 0.25 mm.

(3) Small slender, colourless spindles of verrucæ, with pointed simple warts, 0.7 × 0.04 mm.

(*b*) Broken pieces of a colony red in colour, fading to light brown at the ends of the branches and on verrucæ. Many of the anthocodiæ are entirely unretracted, others just appear through the open end of the verrucæ.

Anthocodial armature.

Crown — 3—4 rows of spicules.

Points — One pair of spicules in each, forming a triangle with the first row of the crown.

Spicules. Same as in former specimen.

(*c*) A beautiful specimen with ground colour yellowish pink, and anthocodiæ yellow. The anthocodiæ are nearly all unretracted.

Anthocodial armature.

Crown — 4 rows of spicules.

Points — 2 or 3 spicules in each. When 3 are present, 2 are on one side and 1 on the other.

Spicules (1) Massive spindles, 1.7 × 0.4 mm., thickly beset with compound tubercles;

(2) Spindles of the same type which taper very markedly at each end;

(3) Internal delicate spindles, straight and curved, with small distant spines, 0.35 × 0.03 mm.;

(4) Hockey-stick types, 0.44 × 0.05 mm.;

(5) Warty ovoid forms, 0.4 × 0.2 mm.

(*d*) Small pieces of a colony, brown in colour with white anthocodiæ, nearly all retracted.

Anthocodial armature.

Crown — 3 rows of spicules.

Points — 1 pair of spicules, converging at the apex, and very divergent at the base.

Spicules — (1) Large spicules of coenenchyma, thickly beset with rough warts, 2.1 × 0.36 mm. 0.8 × 0.12 mm.

(2) Slenderer forms with widely separated pointed spines, 0.45 × 0.43 mm.

(*e*) From Station 305 there are numerous broken terminal twigs, evidently all from one large colony, which agree very closely with those described above (*a*).

(*f*) Another colony from Station 162 is identical with (*a*).

Previously recorded from N.W. Australia, Ternate, the Red Sea, Providence and the Maldives.

15. *Siphonogorgia obspiculata* Chalmers. (Plate IV, Fig. 5; Plate XXV, Fig. 1).

See: CHALMERS, Proc. Roy. Phys. Soc. Vol. XXI, Part 4, p. 164.

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 3 Ex.

Four rigid colonies of a yellow colour, standing 5.5—3.5 cm. high, and one small fragment of a colony. The main stem is broad and massive, especially at the base, where in one specimen it is 12 mm. across. The branches are short and lobate and arise about half way up the main stem. Polyps occur close together on the branches and on the upper portion of the stem.

There is nothing very remarkable about the specimens, and yet the spiculation cannot be identified with that of any of the numerous species. What is characteristic in the spindles is the bluntness of both ends in the great majority; often they are broadly clubbed or knobbed at the ends.

The anthocodial armature consists of a crown of 4—5 transverse rows, and points formed by 3—4 pairs of spindles in chevron. The anthocodiæ are yellow in colour. Prominent verrucæ, long and cylindrical, occur all round. The anthocodiæ are completely retracted within them. The stem is of the Chironephthya type with large internal canals and thin walls.

The largest spicules are 3.8 × 0.4 mm. They incline to be somewhat narrow rods, often approaching the finger-biscuit type with blunt, often clubbed, ends. They are thickly covered with warts, standing out vertically, often low, slender, and simple; but on the broader spicules low, broad, and compound.

16. *Siphonogorgia obtusa* Chalmers.

See: Chalmers, Proc. Roy. Phys. Soc. Vol. XXI, Part 4, p. 167.

Stat. 144. Anchorage north of Salomakieë (Damar)-island. 45 M. Coral bottom and Lithothamnion. 1 Ex.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.

Two specimens resemble *S. mirabilis* in many ways, but they have broader crowns in the anthocodiæ, and more massive spicules. One is dark red in colour with pink anthocodiæ, and the other orange red with orange anthocodiæ. There is very little branching, a main stem and one short branch forming the whole in both colonies. The base of attachment is present in only one of the specimens. It is 4 mm. broad, and the stem gradually diminishes to 2.5 mm. at the top, the total height being 6.5 cm. Polyps occur on the main stem and on the branch, but the main stem is barren for a height of 2 cm. The crown of the anthocodiæ has 8—10 rows of spicules, and the points have two pairs of large spicules converging at the top, with one single small spicule or a pair of small spicules between them. The verrucæ are composed of very small spicules, and are open at the top, so that they are cylindrical rather than cone-shaped, and the retracted anthocodiæ can, in some cases, be seen.

The canal walls are thick with spicules. The spicules of the general coenenchyma are short and broad, with very large spherical warts close together. They are yellow-greenish brown, and also pink. Some of the smaller ones are the same length as breadth. A common size is 1.3 × 1.4 mm.

17. *Siphonogorgia palmata* Thomson and Simpson.

For description see: Thomson and Simpson, An account of the Alcyonarians collected by the Royal Marine Survey Ship, Investigator, in the Indian Ocean, Part II, 1909, p. 133.

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.

A colony with a long, stout, barren, main stem, divides at the top into two short fingerlike branches, covered with polyps. It is near *S. palmata* Thomson and Simpson, but the crown of the anthocodiæ has six rows of spicules, instead of eight.

The following points are to be noted:

(1) Anthocodiæ very large.
Anthocodial armature. Crown — 6 rows of large spicules.
Points — 2 large spicules, irregularly placed en chevron, and one or two very much smaller ones between.
(2) Verrucae large, prominent, ledge-like, very crowded at the ends of the branches, none on the main stem.
(3) Anthocodiæ retracted.
(4) Four or five large canals with thin walls.
(5) Spicules large and colourless spindles, with large multi-tuberculate warts — 3.3 × 0.5 mm.
(6) Colour — yellowish-white, with white anthocodiæ.

Previously recorded from the Andamans.

18. *Siphonogorgia pauciflora* Chalmers.

See: CHALMERS, Proc. Roy. Phys. Soc. Vol. XXI, Part 4, p. 168.

Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 1 Ex.

Numerous broken branches all appear to belong to the same species. The branches are pale yellow in colour and slender, with polyps very far apart, occurring all along their length. There is very little secondary branching, some branches 3—4 cm. in length only giving off one twig, others none. The breadth of the branches is extraordinarily uniform, 2.5 mm.

The anthocodiæ are very heavily armed, especially the points, which have 4—5 pairs of spicules arranged in chevron. The two outermost pairs of spicules are very much larger than the others; the crown consist of 5—6 rows of spicules. The verrucæ are prominent, in some cases 1 cm. apart. Some completely enclose the anthocodiæ, in other cases the anthocodiæ are unretracted. Three large canals, with thin walls, occur in the main stem.

The spicules are colourless and also yellow, stout spindles, with large compound warts. Smaller ones, with simple warts far apart, also occur. Measurements: 1.1 × 2.5 mm., 0.7 × 0.03 mm.

19. *Siphonogorgia ramosa* Chalmers. (Plate IV, Figs. 8 and 9; Plate XXV, Fig. 3).

See: CHALMERS, Proc. Roy. Phys. Soc. Vol. XXI, Part 4, p. 163.

Stat. 204. Between islands of Wowoni and Buton; northern entrance of Buton Strait. 75—94 M. Sand, with dead shells. 1 Ex.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand, with few pieces of dead coral. 2 Ex.

Three interesting specimens with branches in one plane. All branches and sub-branches on the same specimen arise at the same angle (60°—90°), giving the appearance of a series of parallel lines. The general build of the colonies is slender, the broadest part of the main stem, at the base of the largest colony, being 3 mm., and the usual breadth of the branches and sub-branches under 2 mm. Their total heights vary from 9 to 12 cm. Polyps occur on the main

stems and branches, a short barren area, of varying height, occurring at the base of the main stems. The colour is pale yellow with an occasional outcrop of pinkish spicules. On the basal portion, and on the rootwork, the red colour is very pronounced.

The anthocodial armature consists of 2 or 3 rows of spicules in the crown, and 8 small spicules in each point, arranged in four pairs in chevron. The anthocodiæ are small and white. Obtuse and prominent verrucæ, into which the anthocodiæ are well retracted, occur all round, and a common height is 1.5 mm. Some of them show a hint of eight rays on the top, but the great majority are so firmly contracted, that no trace of an opening can be seen without dissection. The core is composed of interlocking tuberculate spindles, both colourless and red. There is a distinct red zone next the cortex. There is usually a central canal, with two or three others towards the periphery, separated by thick walls filled with spicules.

The spicules include the following forms:

(1) Most characteristic are relatively broad, blunt-ended spindles, densely covered with compound tubercles. The majority fall within the limits of 0.2 × 0.1 mm.—0.5 × 0.2 mm.

(2) Numerous narrow spindles, without the very large tubercles. Most of them are about 0.2 mm. in length.

(3) Irregularly branched red forms, with very long prominences, sometimes much more developed on one side than on the other. Some of these are crescents, 0.4 mm. from tip to tip, with disproportionately long compound prominences.

(4) A few straight red spindles 0.4 mm. in length, with distant prominences.

20. *Siphonogorgia rugosa* Chalmers.

See: Chalmers, Proc. Roy. Phys. Soc. Vol. XXI, Part 4, p. 164.

Stat. 166. 2° 28′.5 S., 131° 3′.3 E. 118 M. Hard, coarse sand. 1 Ex.
Stat. 204. Between islands of Wowoni and Buton; northern entrance of Buton Strait, 75—94 M. Sand with dead shells. 1 Ex.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 2 Ex.

Miss Chalmers found it impossible to refer these specimens to any of the previously described species. The peculiarities are the following:

(1) The anthocodiæ are long and thin and flattened from side to side. The anthocodial armature consists of points formed of 4—5 pairs of approximately uniform spicules in chevron and a crown of 3—4 rows.

(2) The verrucæ are prominent, about 2 mm. in height, and often far apart. In many cases single spindles extend over the whole space from base to tip.

(3) The anthocodiæ may be completely encircled by the verrucæ, but are often entirely unretracted.

(4) A few large canals with thin walls occur in the stem.

(5) The stem and verruca spindles are very large, up to 5 mm., but they do not agree with *S. macrospina* or with *S. macrospiculata*. They are very thickly beset with short compound warts, often producing the appearance of sloping rows.

One specimen is altogether bright red; it rises to a height of 6 cm.; and gives off two or three slender branches, almost vertically. The anthocodiæ are white. A second specimen is red in the sterile stalk portion, which is 4 cm. high and about 7 mm. in breadth, but the

upper portion, 6 cm. high, is almost wholly yellow. It gives off five slender, almost vertical branches. Again the anthocodiæ are white. Three other specimens occur, which are merely long slender branches broken off from colonies. Their colours respectively are white with large yellow anthocodiæ, salmon pink with white anthocodiæ, and yellow with white anthocodiæ.

21. *Siphonogorgia simplex* Chalmers.

See: CHALMERS, Proc. Roy. Phys. Soc. Vol. XXI, Part 4, p. 166.

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.

A small slender colony rises straight up, from a base of attachment of 2 mm., to a height of 3.5 cm. The stem remains almost the same width throughout, and no branching occurs. The lower half of the stem is completely barren, and the upper half is covered with polyps at very regular intervals of 3.5 mm. The polyp-bearing portion of the stem is very deeply furrowed. The colour of the colony is greyish-yellow, and the anthocodiæ are white.

The crown of the anthocodiæ consists of 7 or 8 rows of spicules and the points of 3—4 pairs in chevron.

The verrucæ are prominent and cone-shaped, and entirely encircle the retracted polyps. Four large canals with thin walls occupy the whole of the stem. They are of equal size, dividing the stem into four quadrants.

The spicules are snow-white, slender, needle-shaped, with pointed ends, and with very prominent warts. Many are 1.55×0.11 mm.

The anthocodiæ of *S. simplex* are very near those of *S. harrisoni* (Th. and R.) and *S. pallida* (Stud.), but the species differs markedly from the former, in having thin, soft canal walls instead of stiff walls, thickly filled with spicules, and from the latter in the shape and size of the spicules.

22. *Siphonogorgia splendens* Kükenthal.

For description see: KÜKENTHAL, Japanische Alcyonaceen, 1906, p. 80.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.

A very poor specimen of this species, has a long, broad, barren stem with one short polyp-bearing branch at the top. It is ivory white in colour, with orange red polyps, and differs from *S. variabilis* only in the number of rows in the crown of the anthocodia. There are 10 rows in the crown of *S. variabilis* and only 3—4 rows in *S. splendens*. Very large spicules occur in the verrucæ, some of them attaining a length of 2.5 mm. The anthocodiæ are only half-retracted within the verrucæ.

Previously recorded from the China Sea.

23. *Siphonogorgia variabilis* (Hickson). (Plate IV, Figs. 3, 10 and 12).

For description see: HICKSON, The Alcyonaria of the Maldives, Part I, 1903, p. 488.

Stat. 60. Haingsisi, Samau Island, Timor. 23 M. Lithothamnion in 3 M. and less. Reef. Ex.
Stat. 117. Kwandang-bay-entrance. 80 M. Sand and coral.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. Sand, small stones and shells. Ex.

Stat. 204. Between islands of Wowoni and Buton. 73—94 M. Sand with dead shells. 2 Ex.
Stat. 220. Anchorage off Pasir Pandjang, west Coast of Binongka. 278 M. Coral sand. 1 Ex.
Stat. 257. Du-roa-Strait, Kei-islands. 52 M. Coral. 1 Ex.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.
Stat. 277. Kulewatti-(Sollot)-bay, Dammer-island. 45 M. Sand, white and black mixed. 1 Ex.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 1 Ex.
Stat. 294. 10° 12′.2 S., 124° 27′.3 E. 73 M. Soft mud with very fine sand. 2 Ex.
Stat. 305. Mid-Channel in Solor-strait off Kampong Menanga. 113 M. Stony. 1 Ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.

This common species is represented by numerous specimens, of very varied form and colour. All agree in anthocodial armature, having a crown of 8—10 rows of spicules, and points with 2 pairs of principal spicules, en chevron, and sometimes smaller ones between them.

The differences can best be summarised in a table.

Table of variations in colour and mode of growth of *S. variabilis*.

No. of specimens	Colour of Coenenchyma	Colour of Anthocodiæ	Mode of Growth	Station
2	Cream — red at the tips of the branches	Orange	Bushy colony; much branching from all parts of the stem; polyps on ends of branches and twigs only.	Not marked
1	Pale brown-pink	Orange	A few short drooping branches in a cluster at the top of a thick main stem; polyps only on these branches.	310
3	Red	Yellow	Barren main stem with very short branches, coming off mainly from the upper half.	60
1	Yellow	Yellow	Barren main stem with very short branches, coming off mainly from the upper half.	60
1	Brownish-yellow	Brownish-yellow	Stands rigidly upright; gives off irregular short branches with a hint of drooping; a few polyps occur on the main stem.	277
1	Reddish-yellow	Yellow	Straight slender barren stalk, gives off two stiff straight lobate branches with polyps.	305
3	Red	Yellow	Small colonies with perpendicularly directed branches coming off near the base.	164, 277
10	White-cream	Reddish-purple	Usually a long flexible smooth barren stem, with short branches mainly at the top; anthocodiæ large, few and conspicuous, occur on the branches only.	306, 204, 294, 310, 117, 289
1	Red	Orange	Many stiff short branches with polyps given off from a broad, barren stem.	220
1	Reddish-purple	White	Short drooping branches given off half way up a broad stem; polyps on these, and on the main stem, above the point where the branches begin.	257
1	Red	Red	Very slender main stem, with polyps at the top, and one slender branch also with polyps.	289
2	Cream	Purple	Thick main stem and much branching; polyps on the branches; very rough appearance; spicules loosely packed.	260, 117

Note on the Evolution of Species within the Genus.

In considering the relationships between the various species of Siphonogorgia, it seems probable that the presence of a large number of small spicules in the points of the anthocodiæ is more primitive than a smaller number of large spicules. Similarly, a crown composed of many rows of slender spicules, is probably a more primitive condition than a crown with only a few rows of heavy spicules. The most primitive type of crown is not however always to be found associated with the most primitive type of points, nor the least primitive crown with the least primitive points. Thus *S. media* is an example of a species with one pair of clearly defined spicules in the points, but the crown may extend to twelve rows. On the other hand, *S. cylindrata* has primitive points of three to four pairs of spicules and a crown of only three to four rows. The most primitive forms as regards anthocodial armature are distinctly in the minority.

If we interpret the most specialised forms of anthocodiæ as having three to six rows in the crown, and one pair of principal spicules in the points, *S. asperula*, *S. flavocapitata*, *S. hicksoni* (Harr.), *S. macrospiculata*, *S. mirabilis*, and *S. robusta* all lie between these limits, while *S. dofleini* is the only species with twelve rows in the crown and four pairs in the points. No forms have been previously described even with so many as eight rows in the crown, and three to four pairs in the points; but such occur amongst the specimens from the Siboga Expedition, viz., *S. eminens* Chalmers, and *S. simplex* Chalmers.

The view suggested is that a trend of evolution in species of Siphonogorgia has been (1) towards a reduction of the number of spindles in the points, two hockey-clubs being best of all; and (2) towards a reduction of the number of rows of horizontal spindles in the crown, three or four rows being probably an optimum. It may be that a reduction in the number of spicules in the crown and points implies more effective movement of the anthocodiæ, effective as regards rapid retraction from stimuli and as regards rapid capture of nutritive particles or organisms. Other lines of utilitarian evolution may perhaps be discerned in verrucæ, branching, solidity and so forth.

Genus **Scleronephthya**.

The genus Scleronephthya includes Nephthyids without supporting bundle, with thick canal-walls thickly supported by spicules, with polyps singly or in bundles, and with hints of an irregular internal axis in the stem formed of compacted spicules.

The terminal portions of the variously branched stem are thickly covered with polyps. The mouth of the polyp is covered by eight points of spicules in chevron, continued on to the bases of the tentacles, with a more or less pronounced crown or basal collaret, the distinctness of which depends largely on the state of contraction. The spicules include large and small, straight and bent, strongly tuberculate spindles.

The known species are *S. pustulosa* W. and S. and *S. flexilis* Thomson and Simpson. To this genus we transfer *S. crassa* (= *Paraspongodes crassa* Kük.) and must add *S. flexilis*, var. *compacta*. The following contrast may be indicated:

S. pustulosa, each point with 2—3 pairs of chevron spindles; a distinct collaret, polyp-bundles more distant, and with numerous very small spicules lying on the cortex between the large spindles;

S. flexilis, each point usually with one pair of large spindles, sometimes with another pair; with a collaret or crown less conspicuous than in *S. pustulosa*; canal spindles much larger than in *S. pustulosa*;

S. flexilis var. *compacta*, each point with a pair of large spindles; with a basal collaret of about four rings; a characteristic abundance of bow-shaped tuberculate spicules, both slender and broad. The more compact mode of branching, with numerous hummocks of crowded polyps on a few short divisions of the stem, is like that of *S. flexilis*.

S. crassa, each point with 2 pairs of spindles in chevron with occasional intermediates, passing below into the sloping spindles of the polyp; with very large polyps.

1. *Scleronephthya crassa* (Kükenthal).

For description see: KÜKENTHAL, Alcyonaceen von Ternate, 1896, p. 132, 2 figs.
—— Versuch einer Revision der Alcyonarien, II, 1906, p. 378.

Stat. 181. Amboina. 36—54 M. Mud, sand and coral. 4 Ex.

Four specimens of a creamy-grey colour and substantial build agree closely with the form which KÜKENTHAL described as *Paraspongodes crassa*. There is no supporting bundle, but the polyp-stalk is well strengthened by sloping spindles irregularly disposed, and stronger dorsally than ventrally. The anthocodial armature consists of eight points, each of two pairs of spindles in chevron, with the addition of occasional intermediates, and passing below into those supporting the polyp stalk, the uppermost of which may come to lie horizontally in certain states of contraction. A cross section of the stem showed what KÜKENTHAL's specimens did not disclose — a distinct central fusion to form the beginning of a spicular axis; and this points definitely to the genus Scleronephthya.

The polyps are large, up to 2 mm. in total length with a breadth of 1.1 mm. The spindles of the points are 0.4—0.6 mm. long; in the body of the polyp they may attain a length of 1 mm. All are densely covered with small simple prominences.

In the cortex of the stem lie spindles up to 1.4 mm. in length with a breadth of 0.12 mm., thickly covered with compound warts. In the densely spiculose canal walls lie spindles up to 1.3 × 0.15 mm. in size, covered with simple conical, or slightly warty, projections.

The specimens all show the same mode of growth — a rigid stout encrusting stem with single polyps or with polyp-bearing lappets arising directly from it, often almost from the base of the stem. The stem gives rise to branches and twigs, both bearing polyps which are denser towards the tips of the twigs.

The finest specimen has a basal membrane encrusting a stone. From this arise two main stems (one of which was broken off), the larger with a height of 6.2 cm., a spread of about 4 cm., and a maximum stem diameter of 2.3 cm.; the smaller with a height of 5 cm. and a spread of 5 cm. The twigs and branches in all the specimens are much more flexible than the rigid main stem.

Previously recorded from Ternate (30 M. depth).

2. *Scleronephthya flexiils* Thomson and Simpson, var. *compacta* n. (Plate XV, Fig. 11; Plate XXII, Fig. 7).

Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 M. Sand, small stones and shells. 15 Ex.
Stat. 279. Roma-island. 36 M. Mud and sand. 1 Ex.

Numerous colonies of a brownish or cream colour from Station 164, with a very short sterile stem, and a few short main branches which bear numerous hummocks densely covered with polyps. Two colonies had the following dimensions: (*a*) 4 cm. in height, 3 cm. in breadth; (*b*) 6 cm. in height, 2.5 cm. in breadth.

The body of the polyp is supported by irregular lines of curved spindles, and this armature leads at the top to eight points, consisting of a pair or two pairs of chevron spindles. Intervening between the points and the longitudinals there is sometimes a single or double collaret of horizontals. The horizontals vary considerably in number and distinctness according to the state of contraction; they cannot be regarded as a "crown" in the sense in which this term is used in Axifera; they belong to the polyp-stalk more than to the anthocodia. Within the points are seen the heavily spiculated dorsal surfaces of the retracted tentacles. The canal walls contain heavy warty spindles up to 2 mm. in length.

The spiculation agrees generally with that of *S. flexilis*, but there is a much larger number of bow-shaped forms, both slender and stout. The differences do not appear to us to be of more than varietal value.

A small colony from Station 279 shows the same mode of growth, and the same armature of the polyp, but the surface of the stem is smooth, without the wrinkles so commonly found in this species. The spiculation shows the same types of spindle, but there is a smaller number of the tuberculate bow types; and the delicate spindles from the polyps are somewhat smoother.

We are inclined to regard *Scleronephthya flexilis* Thomson and Simpson as a somewhat variable species, difficult to deal with when the colonies are young and the canal-walls cannot be called thick, and no trace of central fusion is to be seen. In larger colonies, however, the central fusion is sometimes very distinct.

Yet the specimens are Nephthyids without trace of supporting bundle; the polyps arise singly in thick clusters on the short branches; they show a characteristic armature of warty straight and curved spindles; the warts are sometimes compound, sometimes simple and relatively longer.

Contracted colonies of this species bear a strong superficial resemblance to *S. pustulosa*.

Previously recorded from E. coast of Sumatra.

3. *Scleronephthya pustulosa* Wright and Studer.

For description see: WRIGHT and STUDER, Challenger Report, 1889, p. 229, 2 figs.

Stat. 47. Bay of Bima. 55 M. Mud with patches of fine coral sand. 5 Ex.
Stat. 50. Labuan Badjo, Flores. Up to 40 M. Mud, sand and shells. 1 Ex.
Stat. 144. Damar-island. 45 M. Coral bottom and Lithothamnion. 1 Ex.
Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 M. Sand, small stones and shells. 1 Ex.
Stat. 257. Duroa-strait, Kei-islands. Up to 52 M. Coral. 2 Ex.
Stat. 277. Dammer-island. 45 M. Sand, white and black mixed. 3 Ex.
Stat. 310. 8°30' S., 119°7'.5 E. 73 M. Sand with few pieces of dead coral. 4 Ex.
Stat. 315. Sailus Besar, Paternoster islands. Up to 36 M. Coral and Lithothamnion. 2 Ex.

Specimens from several stations are referable to this species. They agree with WRIGHT and STUDER's description save that the grouping of the polyps is rather more compact, due mainly to the strongly contracted state of the specimens. They stand in close-set dense groups on the twigs and surface of the branches and stem, where they may also occur singly. The greater part of the stem, however, appears quite naked. Most of the specimens are contracted so that the stems are wrinkled transversely, and most of the polyps have a shorter, more flattened appearance than in the few better preserved colonies. The anthocodial armature consists of 8 points, each with 2—3 pairs of large bow spindles in chevron. The body of the polyp is covered with sloping spindles which become horizontal beneath the points so that a kind of collaret is formed. We have seen none, however, with a collaret quite so decidedly marked off from the other polyp-body spicules as is shown in WRIGHT and STUDER's figure. Small spicules are found in the tentacles, and the whole surface of polyps, stem and branches is covered with numerous small spicules, 0.08 mm.—0.1 mm. in length, which help to give the surface of the stem its granular character. Larger warty spindles, straight and curved, are found in the cortex and in the canal walls where an irregular axis is formed of compacted spicules.

Among the spicules the following types may be distinguished:

(*a*) massive broad spindles, straight or curved, densely covered with compound warts sometimes with a suggestion of zoning; 1.2 mm. × 0.2 mm.;
(*b*) slender spindles straight or curved, with fewer warts; 0.7 mm. in length by 0.06 mm. in breadth;
(*c*) very small and slender spindles, 0.2 × 0.02 mm.;
(*d*) short rodlets, sometimes bent, with the warts very prominent for the total size; 0.22 × 0.05 mm.; 0.8 × 0.03 mm.

Of several colonies from Station 47, the finest has a height of 3.8 cm. and a maximum breadth of 3.2 cm. It is flattened in one plane.

A fine specimen from Station 310 stands 5 cm. in height, of which 2.5 is occupied by the sterile stalk. A characteristic feature is the shortness of the branches and the close-set crowd of polyps. What catches the eye at once is the distinctness of the chevron triangles on the tentacles and the rows of transverse spicules on the polyp body.

Various young colonies, some rather weathered and contracted, from Stations 50, 144, 164, 257, 277, 310 and 315, seem also referable to this species.

Previously recorded from Japan and Philippines.

Genus **Stereacanthia.**

1. *Stereacanthia indica* Thomson and Henderson.

For descriptions see:
THOMSON and HENDERSON, Alcyonarians of Indian Ocean, Part I, 1906, p. 13, 2 figs.
THOMSON and SIMPSON, Alcyonarians of Indian Ocean, Part II, 1909, p. 140.

Stat. 117. 1°0′.5 N., 122°56′ E. 80 M. Sand and coral. 1 Ex.
Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 2 Ex.
Stat. 257. Duroa-strait, Kei-islands. Up to 52 M. Coral. 1 Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion, sand and coral. 1 Ex.

Several small specimens, some fragmentary, from Station 258, are referable to this species,

agreeing entirely with the previous descriptions. One of the complete specimens shows a basal disc from which arise two main polyparia. The larger of these, 1 cm. in height and with a maximum breadth of 9 mm. shows a very short stem, about 2 mm. in length, which then gives rise to short polyp-bearing lobes. A few polyps are found also on the stem itself. Both stem and branches are firm and have a rather rigid appearance, due mainly to the presence of large colourless spindles. These also densely fill the canal walls.

The polyp, which is generally slightly incurved, is supported by sloping spindles which tend to become more horizontal towards the base of the tentacles. In some of the polyps a few transversals give the hint of a collaret, but this is not present in many. In shrunken and more contracted specimens all the spicules of the polyp stalk may become more horizontal. There is definitely no supporting bundle, though some of the dorsal spicules may be a trifle stronger than the rest. At the bases of the tentacles are eight points, with projecting tips. Each point shows 2—4 spindles in chevron. Double rows of very small spicules are also found on the tentacles. The maximum size of a polyp is 2 mm. in length and 1 mm. in breadth.

The spicules are all spindles, straight or slightly curved or twisted. The spicules of the points are small bow-shaped forms, 0.3—0.5 mm. across. They are less densely warted than those of the stem and branches.

Measurements taken of the spicules of the stem and branches were 1.8 × 0.18 mm.; 0.9 × 0.08 mm. The colour is a pale cream brown, with the colourless spicules of the cortex showing white.

Also two fragments from Station 164 and a small withered colony from Station 117.

Previously recorded from the Andamans, Salomons, Providence, Amirante (Seychelles).

2. *Stereacanthia spiculosa* (Kükenthal).

For description see: KÜKENTHAL: Japanische Alcyonaceen, 1906, p. 67, 3 figs.

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 1 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 22 M. Mud, coral and Lithothamnion. 1 Ex.
Stat. 303. Haingsisi, Samau-island. 27—45 M. 1 Ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.

A small brown colony from Station 289 is in general agreement with KÜKENTHAL's *Eunephthya spiculosa*. KÜKENTHAL noted, however, that the systematic position of this admittedly aberrant species was doubtful; and though we have not seen his specimen, we refer it along with our own specimens, to the genus Stereacanthia. The specimens show the typical Stereacanthian features — (*a*) a sterile stalk with the cortex and the canal walls filled with straight or curved spindles densely covered with warts, and (*b*) thickly armoured polyps which do not show a true supporting bundle. The spicules in the canal walls separate it from the genus Eunephthya, whose diagnosis includes the character "canal walls not thickly filled with spicules". The closely grouped polyps (non-retractile except as regards their infolded tentacles) show an armature of 2 to 3 pairs of rough chevroned spindles on each point and three or four rows of transverse spindles at their base. Below these are more irregularly arranged spicules, sloping or tending to a vertical arrangement. The sloping spindles of the eight points

pass almost insensibly into those on the dorsal surface of the tentacles; and similarly the basals or transversals may merge with those of the polyp stalk. The maximum length of a polyp is 2.2 mm. and breadth 1.5 mm. The colony has a breadth of 2.2 cm. and a height of 1.4 cm. The spicules are all spindles, straight and bent, of many sizes, mostly with very prominent compound warts, some with simple cones. Those of the points have a length of about 1 mm.

A pinkish specimen from Station 301 has a total height of 3.7 cm. The densely spiculose sterile stem gives off 5 main branches covered with polyps, the first branch at a height of 1.7 cm. The specimen is rather shrunken and contracted, and the stem and branches are grooved and wrinkled. It bears a strong superficial resemblance to *Stereonephthya whiteleggi*. The maximum size of a polyp is 2.8 mm. The canal walls are thickly filled with stout warty spindles up to 0.9 mm. in length.

Compared with *Stereacanthia indica*, all these specimens show cortex and polyps more densely filled with spicules, the larger ones shorter and tending to a greater equality in size (average length 0.7 mm.), while between these the cortex is filled with smaller spindles.

Previously recorded from Sagami Bay (Japan).

Genus **Cactogorgia.**

1. *Cactogorgia lampas* Thomson and MacKinnon. (Plate III, Figs. 3 and 5; Plate VI, Fig. 10).

For description see: THOMSON and MACKINNON, Alcyonarians of Sladen Expedition, Trans. Linn. Soc. XIII, 1909, p. 296, 2 figs.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 3 Ex.
Stat. 260. 5°36′.5 S., 132°55′.2 E. 90 M. Sand, coral and shells. 2 Ex.

Two orange-coloured colonies, from Station 164, the larger rising to a height of 6.2 cm., with a polyp-bearing head, 1.4 and 1.8 cm. in diameters. The whole surface of the stalk is densely spiculose, the arrangement mostly longitudinal.

Strongly built upward-looking verrucæ shelter the retracted anthocodiæ, whose spicules are colourless. There is a crown and points arrangement, with about six to eight or even ten horizontal rows to the crown, and three (or sometimes four) sloping pairs of spindles in each point.

The specimen agrees well with *C. lampas*, and is quite characteristic of this peculiar Nephthyid genus.

Another specimen, incomplete, from the same station, has a height of 1.11 cm. and a head with diameters of 1.1 cm. and 8 mm.

Of two specimens from Station 260, one, 3.8 cm. long, has a proportionately very slender stem (average diameter 2.5 mm.) and a head with a maximum diameter of 9 mm. The shorter specimen, 2.4 cm. long, has a stouter stem (average diameter 4 mm.) The colour of both is a yellowish-brown and in both the polyps are fully expanded. In these specimens the spicules of the crown and points are not colourless but tinged with yellow. There are 3 pairs of spindles in the points, and the crown has up to ten rows of spindles. The spicules agree well with those of *C. lampas*.

Previously recorded from Seychelles.

2. *Cactogorgia simpsoni* n. sp. (Plate XV, Fig. 6; Plate XXVII, Fig. 3).

Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 1 Ex.

A colony, growing on a stone, from Station 289, shows characters agreeing with none of the four previously described species of this genus. The deeply furrowed, bent stem, with a diameter of 9 mm., rises to a height of 3.7 cm. It is thickly covered with longitudinally arranged colourless spicules, all spindles, up to 2.5 mm. in length and 0.35 mm. in breadth, covered with large compound warts. It expands at the summit to form a slightly convex polyp-bearing head, 1.5 cm in diameter, which is covered with closely adjacent verrucæ, up to 2.3 mm. high, and 4 mm. in diameter, with their walls strongly armed with upward sloping spindles.

The anthocodiæ are almost all retracted within the verrucæ. They show a well-developed armature — a deep crown of up to about fifteen rows of transversely arranged spindles, and above this eight points which show considerable irregularity in the size, number and arrangement of the spicules. There frequently occur two dominant pairs of chevroned spindles, up to 1.4 mm. in length and 0.05 mm. in breadth, with a pair of much slighter and smaller chevroned spindles included at the base, and occasionally with one to three outer laterals lying alongside. In addition to this type of point there are other points of a very different appearance, sometimes occurring on the same polyp. They show three to five pairs of more irregularly disposed and much less massive chevroned spindles. All these anthocodial spindles are covered with fine, simple prominences.

The tentacles, which are found in various stages of contraction, some fully contracted within the polyp, are densely armoured with small, slightly roughened or frayed rodlets, which tend to arrange in chevron towards the base of the tentacle, where they are about 0.3—0.5 mm., but become very much smaller and more densely packed in a longitudinal arrangement towards the tip. The pinnules are also thickly covered with very minute rodlets arranged transversely.

Lining the verrucæ, continued from the base of the retracted polyp, is a thin layer in which lie numerous small, scale-like, orange-coloured spicules, longitudinally disposed in eight longitudinal bands or zones. These are vertically ridged when the verruca is closed. The majority of the small sclerites are like smooth dumb-bells, with a decided waist. (Common dimensions are 0.09 × 0.05 mm.). These lead on to slightly larger and rougher dumb-bell forms with a few simple low prominences (0.11 × 0.05 mm.). Very small young stages are also seen with the waist less marked. In addition, and on a somewhat different line of development, there are longer, narrower types, like finger-biscuits (0.14 × 0.03 mm.).

The canal walls are densely filled with spindles, covered with small, simple spines. Common dimensions are 1.4 mm. × 0.16 mm.

The colour is a dirty white with the edges of the verrucæ orange. The colour of the colony figured (Plate XV, fig. 8) has come out somewhat too pronouncedly brown.

As regards anthocodial armature

C. celosioides is marked by points with one pair of dominant chevroned spicules, and by 7—10 rows of horizontals;

C. expansa is marked by points of 6—8 pairs of chevroned spicules, and by 8 rows of horizontals;

C. alciformis is marked by points of 10—15 spicules, tending to chevron, but more irregular than in the other species, and by 10—14 rows of horizontals;

C. lampas is marked by points of about 3 pairs of chevroned spicules and by about six rows of horizontals;

C. simpsoni is marked by well-defined points which may consist (*a*) of two dominant pairs of chevroned spindles, plus three laterals on each side, and often an included pair at the base of the chevron triangle, or (*b*) of 3—5 pairs of more irregularly chevroned less massive spindles; and by up to about 15 rows of horizontals.

Family Fasciculariidae.

Genus **Paralcyonium.**

1. *Paralcyonium elegans* Milne-Edwards. (Plate XIII, Fig. 5).

Milne-Edwards, Mémoire sur un nouveau genre de la famille des Alcyoniens. Ann. Sci. Nat. 2 Ser. IV, 1835, p. 323, 9 figs.
von Koch, Alcyonacea des Golfes von Neapel, Mt. Zool. Station Neapel, IX, 1890, p. 672, 1 fig.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.

An interesting small specimen from Station 164 consists of a stout basal trunk, with its walls thickly filled with longitudinally placed spicules, and above this a branched polyparium partially contracted within the basal trunk, which thus acts as a kind of investing involucre. The total height of the colony is 1.8 cm., of which 1.1 cm. consists of the involucre. This has a maximum diameter of 7.5 mm. The polyparium is so much contracted that one cannot distinguish the precise mode of branching; only the uppermost twigs are clear, with the pedicellate polyps arising irregularly on them. The maximum length of a polyp in our specimen is about 3 mm. with a breadth of 1.4 mm. The walls of the polyps and branches are very thin and transparent, so that the stomodæum and mesenteries are clearly visible within.

Spiculation is entirely wanting in many of the polyps, but a note stating that the preservative was 4% Formalin may help to account for this. The spiculation is seen however on some of the polyps contracted within the involucre. On the walls of the polyp it consists of spindles, in some irregularly disposed, in others arranged longitudinally or sloping on the dorsal surface near the base of the polyp, so that the dorsal surface shows a definite armature. Above this, below the base of the tentacles, are 8 points of very delicate small spindles arranged in chevron, up to about 6 pairs in a point (average dimensions 0.42 × 0.04 mm.). On the dorsal surface of the tentacles there are irregularly sloping crowded rows of minute stout rods (about 0.14 × 0.02 mm.).

The twisted, minutely warted spindles of the involucre attain a maximum length of 3.5 mm. and have an average breadth of 0.1 mm. All are covered with extremely minute simple prominences.

The colour of the calyx is white owing to the dense armature of colourless spicules. The polyparium is a semi-transparent greyish brown.

The genus Paralcyonium agrees with the genus Studeriotes in having a basal involucre portion into which the upper polyp-bearing region can be retracted. It differs from it, however, in the delicacy and transparency of the polyparium, in the less substantial character of the involucre, in the much weaker armature of the polyps, in the much smoother less warty type of spicule, and in the mode of branching of the polyparium (see THOMSON and SIMPSON, Alcyonarians of the Indian Ocean, 1909, p. 12).

Previously recorded from Algiers, and Gulf of Naples.

Genus **Studeriotes.**

1. *Studeriotes crassa* Kükenthal.

For description see: KÜKENTHAL, Fauna Südwest-Australiens, Band III, 1910, p. 73, 3 figs.

Stat. 80. 2° 25′ S., 117° 43′ E. 50—40 M. Fine coral sand. 1 Ex.
Stat. 240. Banda. 9 to 45 M. Black sand. Coral. Lithothamnion-bank in 18—36 M. 3 Ex.
Stat. 258. Tual, Kei Islands. 22 M. Lithothamnion, sand and coral. 15 Ex.

Numerous grey-brown colonies from Station 258 are clearly referable to this species. A typical specimen has a height of 7 cm., of which 2.8 is the flattened stalk portion. The maximum diameters of the stalk are 2.2 cm. and 1.3 cm. The branches vary considerably in length and in state of contraction, the longest up to 2 cm.

The specimens are at once markedly separated from *S. mirabilis* by the massive cup-like involucre of the latter, and from *S. longiramosa* by the weaker supporting bundle and more flaccid character of the branches in the latter. They are nearer to *S. semperi*, but may be distinguished by the following among other features:

(*a*) the polyps are practically without spicules ventrally;
(*b*) there are no transversals in the polyp;
(*c*) the supporting bundle generally projects beyond the polyp;
(*d*) transversely disposed spindles are present in the branch cortex.

Two brown colonies and several fragments from Station 240 and a fragment from Station 80 show the usual features.

Previously recorded from West Australia.

2. *Studeriotes longiramosa* Kükenthal. (Plate XIII, Figs. 6 and 8).

For description see: KÜKENTHAL, Fauna Südwest-Australiens, etc. Band III, Lief. 1., 1910, p. 71, 1 fig.

Stat. 240. Banda. 9 to 45 M. Black sand. Coral. Lithothamnion bank in 18—36 M. 6 Ex.

A fine specimen of this interesting species from Station 240. The firm stalk portion rises to a height of 3 cm., bears a projecting shelf at the top, and then gives rise to numerous delicate branches, much relaxed. The tip of the colony is 8 cm. above the shelf, and an individual branch may be 3 cm. long. The branches bear numerous polyps about 1.5 cm. in height, sometimes in approximate whorls. They are upturned and bent inwards. The supporting bundle shows a longish spindle flanked by two or three smaller ones on each side. It is but a slight supporting bundle compared with what is usual in Dendronephthya. The whole colony resembles the figure by MAY

(Jenaische Zeitschr. XXIII, 1899, fig. 27) for *Nephthya semperi*. The large spindles are those characteristic of Studeriotes, and the largest ones measured were 6 mm. long. A common breadth of the large spindles is 0.4 mm. Very characteristic is the beginning of a sigmoid curve on many of the spindles.

From the same locality a much contracted colony, with precisely similar spicules.

A larger specimen, also from Station 240, showed a stalk portion of 5.5 cm. and a main stem reaching to 16 cm. and giving off 30 finger-like flaccid branches. The stem and branches show a semi-transparency.

Another specimen, from Station 240, has a total height of 12.5 cm., of which the firm stalk portion occupies 3.4 cm. The flaccid contractile part gives off irregularly at different levels about a dozen branches, the longest of which is 4.1 cm., with a diameter of 5 mm. including the projecting polyps.

Another specimen from the same station has a total height of 17 cm., of which 4.5 cm. is made up of non-contractile stalk. The main stem of the flaccid contractile polyparium gives off numerous branches which are in a state of marked contraction so that the polyps lie close together. The maximum length of these contracted branches is 1 cm.

The colour of the stalk portion is a yellowish brown and the flaccid stem and branches are a creamy white.

Previously recorded from China Sea.

3. *Studeriotes debilis* n. sp. (Plate VI, Fig. 5; Plate XIII, Fig. 2; Plate XVI, Fig. 4).

Stat. 114. 0° 58′.5 N., 122° 55′ E., 75 M. Hard sand, very fine. 2 Ex.

Two specimens from Kwandang Bay, along with four of *S. spinosa* n. sp., stand out markedly as a new species. The finer specimen has a strong involucre or super-calyx, thickly armoured with the usual massive spindles, some of which are a centimetre in length. It stands 9.8 cm. in height, with a width of 3 cm. and a maximum though somewhat collapsed thickness of 3.6 cm. The general colour is greyish brown.

From the mouth of the involucre there protrudes a much branched umber-coloured polyparium, rising to a height of 5.3 cm., and bearing about two dozen finger-like branches, altogether covered by the long polyps. But much of the polyparium is not protruded at all. A common length for a branch or lappet is 2 cm., with a breadth of 4 mm.

The polyps occur in serried rows, sometimes in distinct whorls. They are unusually long, on an average 1.7 mm., and are slighty incurved.

The dorsal surface of the anthocodia is supported by chevroned rows of 3—4 pairs of short spindles, which are continued on to the dorsal surface of the tentacles. On the ventral appressed surface of the anthocodia the spiculation is usually sparse and irregular, but points are occasionally to be seen. In the larger specimen the supporting bundle is represented merely by a short peak at the very base of the polyp. In the other specimen this is continued as a triangle for a short distance up the polyp. It comes to this, that the supporting bundle is at most relatively very short, with sometimes 3 or 4 pairs of spindles in chevron.

The large spindles of the involucre are of the usual Studeriotes type. The polyps and their tentacles show small very warty spindles, varying from 0.09 mm.—0.6 mm.

There is an unusual abundance of extrinsic material on the surface of the polyps, e. g., Foraminifera, Sponge spicules, fragments of Polyzoa.

This new species is marked by the following features:

(*a*) the polyps are long and densely crowded;

(*b*) the supporting bundle is either a mere basal peak, or relatively very short;

(*c*) there is a strong contrast between the armature of the dorsal surface of the polyps and that on the ventral surface;

(*d*) the branches or lappets of the polyparium are long tapering fingers, with nothing of the raggedness of *S. spinosa*, and much more substantial and compact than in *S. longiramosa*.

The specimens come nearest *S. semperi*, but may be distinguished by the following features:

(*a*) the supporting bundle is peculiarly weak, instead of being typically strong;

(*b*) distinct points of 3 or more chrevroned pairs are developed dorsally, but are only occasionally observable ventrally;

(*c*) the polyp body is very long, and is strengthened by a larger number of smaller and more irregularly disposed spindles than in *S. semperi*.

4. *Studeriotes spinosa* n. sp. (Plate VI, Fig. 11; Plate XIII, Figs. 3, 4 and 7).

Stat. 47. Bay of Bima. 13—55 M. Mud with patches of fine coral sand. 1 Ex.
Stat. 60. Haingsisi. 23 M. Lithothamnion in 3 M. and less. Reef. 1 Ex.
Stat. 114. 0° 58′.5 N., 122° 55′ E. 75 M. Hard sand, very fine. 4 Ex.
Stat. 133. Lirung, Salibabu-island. Up to 36 M. Mud and hard sand. 1 Ex.
Stat. 240. Banda. 5—20 fathoms and 9—36 M. Black sand. Coral. Lithothamnion-bank in 18—36 M. 2 Ex.
Stat. 285. 8° 39′.1 S., 127° 4′.4 E. 34 M. On the limit between mud and coral. 1 Ex.

Four well-developed specimens from Station 114 require the establishment of a new species.

The larger of the two has a much compressed, very spinose stalk, 11.4 cm. in height, from the top of which there projects a polyparium, partly protruded to a height of 2.4 cm. It consists of numerous very narrow branches (often 1.7 cm. in length), covered with polyps, whose strongly projecting supporting-bundles produce a spiny appearance. The stalk is 1.6 cm. broad at its aperture and tapers to a broken base of 6 mm. It is much compressed from base to aperture, and shows a thickness of not more than 4 mm. — a great contrast to the spacious stalk of some other species, like *Studeriotes mirabilis*. The general colour of the colony is grayish brown.

Each polyp stalk shows a very strong supporting-bundle of a few (about half a dozen) long spindles, some of which extend for almost the whole length of the stalk, about 2.6 mm. Towards the base of the stalk the supporting-bundle broadens out into two lateral fans of shorter spindles; at least two supporting-bundle spindles project prominently beyond the polyp.

The polyp-head shows a heavy armature of chevron rows, about four pairs on each row. But those in the direct line of the supporting bundle are disposed rather longitudinally.

The polyp-head is at right angles to the stalk.

A specimen from Station 133 and a more weathered specimen from Station 47. The colour of both is grey brown.

The specimen from Station 133 has a cylindrical involucre, standing 3.2 cm. in height, with an apical diameter of 1.2 cm. Through the mouth of the involucre there slightly project

S. spinosa n. sp.	*S. debilis* n. sp.	*S. semperi*	*S. longiramosa*	*S. crassa*	*S. mirabilis*
Polyp with strong armature of spindles in sloping chevron rows, 3—6 pairs in a row, with irregularly disposed spicules at the base. Strong, markedly projecting supporting bundle of 2—3 spicules. Finger-like, narrow branches thickly covered with polyps, and with ragged spinose appearance. Numerous transversals in branch cortex. Stalk often narrow and elongated, with spindles up to 12 mm. in length.	Polyps markedly long and densely crowded. Strong contrast between their anthocodial armature on dorsal and ventral surface. Dorsal surface with longitudinal rows of spicules tending to chevron arrangement. Ventral surface with sparse, irregular spiculation. Supporting bundle very short, at most ensheathing extreme base of polyp; shows maximum number of 3—4 pairs of short spicules. Lappets long, tapering, finger-like but substantial. Polyps tending to be in close whorls. Very few transversals in branch cortex. Strong stalk, with spindles up to 10 mm.	Polyp with some horizontal spindles in slightly irregular double rows, almost longitudinal. Polyp spicules with very weak thorns. Strong supporting bundle like a sheath on the polyp head. Two or three spicules projecting, always bent down overhead. Short conical lappets. No transversals on the branch cortex. Stalk spindles up to 4 mm.	Polyp with very irregular almost longitudinal spindles, about 3 pairs in each double row. No transversals. Supporting bundle very distinct, projecting in a single large needle. Transversals in the branch cortex, mostly curved. Elongated partially branched branches. Stalk spindles, up to 10 mm., in longitudinal rows, with fine thorns in transverse rows.	Polyp with lank spindles, converging in irregular double rows, 3 to 4 pairs in a row, finely thorned. No transversals. Supporting bundle like a sheath, carried out into a 2.5 mm. needle, usually projecting. Cortex between polyps filled with transversals. Stalk cortex, relatively thin, leathery, sharply defined. Spindles up to 7 mm.	Polyp with 2—3 pairs of short spindles in chevron. Several rows of transversals, some of which may get pulled up into the chevron pairs so as to form about 4—5 pairs in a point. Supporting bundle not prominent, ensheathing the base of the polyp. A few transversals in the branch cortex. The involucre or stalk is cup-shaped, with very thick cortex. Spindles up to 9.5 mm.

the polyp-covered tips of finger-like branches densely spiculose. The outside of the involucre is thickly covered with the large spicules characteristic of Studeriotes, all longitudinally disposed. The branches of the polyparium are thickly covered with polyps, about 0.8 mm. in length and 0.6 mm. in breadth, which have a strong supporting-bundle, projecting about 0.7 of a millimetre, usually consisting of a couple of spindles, or of one flanked by two. The polyp is bent downwards on its stalk at more than a right angle, and has a strong armature of spindles arranged in sloping pairs in longitudinal rows. There may be 3—6 pairs in a row. At the base of the rows there are a few irregularly disposed spindles.

The smaller specimen from Station 133 has an involucre standing 1.7 cm. in height, with a maximum diameter of 6 mm. The whole polyparium is retracted. The base of the involucre is surrounded by numerous large Foraminifera.

A very young specimen from Banda (9—36 M.), with a diameter of 8 mm. and a height of 4 mm., shows the branches completely retracted within the involucre, which is almost completely closed at the apex. The spicules agree with those of *S. spinosa*, but in such a young contracted colony of Studeriotes it is impossible to be quite certain as to the species.

This species is separated from the others by the fact that the strongly developed supporting bundle projects very markedly and cannot be said to be of the short ensheathing type. It differs from *S. longiramosa* in its greater hardness and in its more compact branches densely covered with polyps. Also distinctive is the depressed inbent appearance of the polyp-heads.

Order GORGONACEA.

Sub-Order SCLERAXONIA.

Family Briareidae.

Genus **Iciligorgia.**

We were fortunately able to examine a very fine "Challenger" specimen of *Iciligorgia orientalis* Ridley, in which we found no medullary canals even in a stem with diameters of 1.2 cm. by 8 mm. Whatever be true of other specimens there is no doubt that the Challenger forms from the Torres Straits cannot be referred to Kükenthal's Machaerigorgia which is marked by the presence of nutrient canals. It may be also noted that this Challenger form has no projecting verrucæ. The centre of the stem, both at the base and towards the tips, shows a differentiation which looks as if it were due to a relative preponderance of organic matter. It seems to us doubtful whether Kükenthal's Machaerigorgia, erected for Ridley's *Iciligorgia orientalis* (with an imperforate axis and no external verrucæ), has any justification whatsoever.

1. *Iciligorgia orientalis* Ridley.

For description see: Ridley, Zoological Collections of the 'Alert', 1884, p. 351, 3 figs. Nutting, Siboga Expeditie. XIIIb, 1911, p. 18, 2 figs.

Stat. 213. Saleyer. Up to 36 M. Coral, mud with sand. 1 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 36 M. Mud, coral and Lithothamnion. 1 Ex.

Fragments of two specimens, of creamy white colour, show the characteristic sharp edges of Iciligorgia, and agree well with the descriptions given by RIDLEY and NUTTING. There is an ill-defined organic differentiation, but there is no central canal in the middle of the medullary portion. The well-defined canals form the typical ring between the cortex and the medulla.

The specimen should therefore be retained in the genus Iciligorgia, and not referred to KÜKENTHAL's (1919) Machaerigorgia which, if real, has medullary nutritive canals.

The spicules belong to the following types:

(*a*) short stout spindles very densely covered with compound warts;
(*b*) short stout spindles with more distant and simpler warts;
(*c*) longer spindles with compound warts, sometimes crowded, sometimes more distant;
(*d*) narrow, slender spindles with only a few prominences, including some practically smooth;
(*e*) a few crosses.

Previously recorded from Torres Straits, West Indies, and by NUTTING from Aru Islands and Paternoster Islands.

Genus **Semperina.**

1. *Semperina brunnea* Nutting.

For description see: NUTTING, Siboga Exp., XIIIb, 1911, p. 12, 2 figs.
KÜKENTHAL, Deutsch. Tiefsee Exp. XIII, 1919, p. 53, 1 fig.

Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion, sand or coral. 1 Ex. Fragments.

Some broken pieces, the largest 11.3 cm. in height, with an average diameter of 6 mm. The colour is light brown. The branching tends to be in one plane, but incurved. It cannot be strictly called dichotomous.

Among the features of this species the following may be noted. The ends of the branches are swollen and sometimes cupped; the polyps are on one surface and on the sides; their low calyces show a collaret of 4—6 rows, followed by a chevron arrangement; the spicules include (*a*) tuberculate blunt-ended ovals, some almost spherical; (*b*) strong curved warty spindles; (*c*) very delicate elongated rods which occur along with (*a*) and (*b*) types in the interior, some almost smooth, others with many low roughnesses.

The genus Semperina is according to KÜKENTHAL separated off from Suberia (1) by being branched, and with the branches swollen at the ends, (2) in having abundant spiculose polyps with true calyces; and (3) in the abundance of long narrow rods in the interior. The genus Suberia would on this view include only *S. clavaria* Studer and *S. capensis* Stuart Thomson.

Previously recorded from Stations 164 and 273 (by NUTTING) Malay Archipelago, Aru Islands.

2. *Semperina köllikeri* (Studer). (Plate V, Fig. 8).

For description see: STUDER, Monatsbericht Akad. Wiss. Berlin, 1878, p. 667, 4 figs.
KÜKENTHAL, Deutsch. Tiefsee Exp. XIII, 1919, p. 56.

Stat. 316. 7° 19′.4 S., 116° 49′.5 E. 538 M. Fine, dark brown sandy mud.

A couple of fragments, about a centimetre in length, agree well with STUDER's description

and figures. The spicules are (*a*) almost smooth delicate rods from the interior, (*b*) the same type with sparse conspicuous prominences, (*c*) numerous more substantial spindles with high simple warts, (*d*) forms derived from the spindle type with irregular jagged prominences. Some of the warty spindles are straight, other slightly curved. No crosses or the like were to be seen, but the fragments are very small.

To STUDER's description must be added the fact that the polyps show very distinct crown and points. The crown shows about three horizontal rows of spindles. Each point is made up of two or three pairs of sloping spindles. The verrucæ are prominent and blunt, with 8 prominences round the margin.

Previously recorded from Three King Islands, North of New Zealand.

3. *Semperina macrocalyx* (Nutting). (Plate XIV, Fig. 3; Plate XXIV, Fig. 6).

For description see:
NUTTING, Gorgonacea of the Siboga expedition VIII. The Scleraxonia XIIIc, 5, 1911, p. 15, 3 figs.
KÜKENTHAL, Wiss. Ergebn. Deutsch. Tiefsee Exp. XIII, 1919, p. 57.

Stat. 122. 1°58′.5 N., 125°0′.5 E. 1264—1165 M. Stone. 1 Ex.

A fragment of a main stem, 2.5 cm. in height, giving off a branch 3 cm. long. The diameter of the broken stem is 4 mm. It agrees thoroughly with NUTTING's description, except that the spindles include relatively broad and flat rough forms, some swollen at one end in pseudo-club fashion. We would add to the description of the anthocodial armature that there is a collaret of about six horizontal rows and above that eight groups of chevroned paired spicules, ending in points above the base of the tentacles.

Previously recorded by NUTTING from the same Malayan Station, 1264—1165 metres.

Genus **Solenocaulon.**

1. *Solenocaulon tortuosum* Gray.

For description see: HICKSON, Alcyonaria of Maldives, 1903, p. 495, 1 fig.
KÜKENTHAL, Wiss. Ergebn. Deutsch. Tiefsee Exp. XIII, 1919, p. 68.

Stat. 91. Muaras Reef, Borneo. 54 M. Hard coral sand. Coral at anchorage. 1 Ex.

A typical fragment from the end of a branch. It is 2.8 cm. in length and shows the usual longitudinal groove. It is salmon-pink in colour with white polyps.

Previously recorded from N. Australia, Maldives, Singapore, Bay of Bengal, Andamans, Ceylon, Cape Comorin, Persian Gulf.

Genus **Spongioderma.**

1. *Spongioderma chuni* Kükenthal. (Plate XXIV, Fig. 9).

For description see: KÜKENTHAL, Wiss. Ergebn. Deutsch. Tiefsee Exped. XIII, 1919, p. 94, 1 fig.

Stat. 310. 8°30′ S., 119°7′.5 E. 73 M. Sand with pieces of dead coral. 3 Ex.

The basal portion of a stiff, upright colony, rising to a height of 7.8 cm., of predominantly roseate colour. The main stem has a basal thickness of 4 mm., apart from the foot-plate.

It gives off numerous upward-curving parallel branches, some of which have secondary and tertiary branches, while others are unbranched. There are prominent calyces, often separated by an interval of 2 mm., and rising to a height of about 1 mm. They narrow slightly towards the mouth, where a hint of the retracted polyp can sometimes be seen. The centre of the medullary portion may show a core of yellowish organic material, but no distinct nutrient canals, which are represented peripherally. The predominant cortical spicules have large very compound prominences; those of the core are relatively smooth with distant prominences or warts. In short, the spiculation agrees with KÜKENTHAL's description.

Two other specimens from the same station show a more pronounced rose-red colour, and the branching is more dichotomous and less pinnate. The spiculation is practically the same. The retracted polyps tested with acid showed no effervescence. In the centre there is a distinct beginning of a firm organic axis, which KÜKENTHAL emphasises as characteristic of Diodogorgia. There are two very clear zones of nutrient canals outside the medullary portion.

Much of the surface is covered with sponge and there are also attached Cirripedes.

Previously recorded from Francis Bay, S. Africa.

Family SUBEROGORGIIDAE.

Genus **Suberogorgia.**

1. *Suberogorgia köllikeri* Wright and Studer.

WRIGHT and STUDER, Challenger Report, 1899, p. 167, 1 fig.

Stat. 133. Lirung, Salibabu-island. 36 M. Mud and hard sand. 1 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 18—45 M. Mud, coral and Lithothamnion. 1 Ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.

A reddish brown specimen from Station 133, 5 cm. in height, with five branches arising at an acute angle and at a considerable distance (e. g. 8 mm.) from one another. The base of the incomplete colony has a diameter of 1.5 mm. and the whole is slender. There is no hint of anastomosis. The verrucae stand out laterally and are very prominent (1 mm. in height). They often show 8 lobes, corresponding to 8 longitudinal lines. The polyps may be entirely retracted or may stand out beyond the verrucæ for a distance of 0.5 mm. They show 8 triangles of curved spindles in chevron and a slight basal collaret. The coenenchyma spicules are mostly very yellow warty spindles, often, but not always, distinctly zoned (0.24 × 0.06 mm.). Other spicules (spindles and rodlets), both yellow and colourless, occur which are almost smooth or with a small number of sharp points (0.18 × 0.02 mm.). A few almost orbicular forms occur. There are similar specimens from two other stations.

Previously reported from off Japan, with varieties from Zanzibar, Ceylon, and Andamans.

Also recorded for the Siboga Expedition by NUTTING from Stations, 164, 273, 274, 305, 310.

2. *Suberogorgia pulchra* Nutting.

For description see: NUTTING, Gorgonacea of Siboga Expedition, Scleraxonia, 1911, p. 30, 3 fig.

Stat. 164. 1° 42′.5 S., 130′ 47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.

A broken fragment of a colony from Station 164 agrees thoroughly with NUTTING's description and figures. The height is 6.7 cm., and the length of the longest of the four straggling pieces is 6.2 cm. The average diameter of the stem is 2 mm. The colour is a beautiful scarlet red with the mouths of the calyces showing yellowish. Many of the calyces are almost completely included; and in no case are they prominent. Most of the spicules are densely warted ovoid spindles.

Previously recorted by NUTTING from Siboga Station 315, East of Sailus Besar, Paternoster Islands.

3. *Suberogorgia verriculata* (Esper).

For description see: NUTTING, Gorgonacea of Siboga-Expedition, XIII b[5], 1911, p. 24.

Stat. 117. 1°0′.5 N., 122°56′ E. 80 M. Sand and coral. 1 Ex.

Fragments of a reddish specimen with predominantly rough curved spindles, some hardly more than ovals.

Previously recorded from N. W. Australia, Japan, Malay Archipelago, Samoa, New Pomerania and by NUTTING from Siboga Stations 299 and 307.

4. *Suberogorgia ornata* Thomson and Simpson.

For description see: THOMSON and SIMPSON, Alcyonarians of the Indian Ocean, II, 1909, p. 164, 1 fig.

Stat. 117. 1°0′.5 N., 122°56′ E. 80 M. Sand and coral. 1 Ex.

Fragments of a delicate colony, probably very young, with very numerous minute polyp heads.

Previously recorded from Andamans, Laccadives, Malay Archipelago and by NUTTING from Siboga Stations 81, 220, and 257.

Genus **Keroeides.**

1. *Keroeides koreni* Wright and Studer. (Plate VI, Figs. 6, 7 and 8).

For description see: WRIGHT and STUDER, Challenger Report on Alcyonaria, 1889, p. 169, 1 fig.

Stat. 117. 1°0′.5 N., 122°56′ E. 80 M. Sand and coral. 1 Ex. in fragments.
Stat. 154. 0°7′.2 N., 130°25′.5 E. 83 M. Grey, muddy sand, shells and Lithothamnion. 1 Ex. in fragments.
Stat. 260. 5°36′.5 S., 132°55′.2 E. 90 M. Sand, coral and shells. 2 Ex. in fragments.
Stat. 289. 9°0′.3 S., 126°24′.5 E. 112 M. Mud, sand and shells. 1 Ex.

Small broken pieces from Station 117 and Station 289 which show the characteristic broad spindles covered with compound tubercles which form an interlocking armature. The distinctions between *K. gracilis* Whitelegge and *K. koreni* Wright and Studer do not seem to us to be of great moment.

Spindle measurements:

1.1 × 0.35 mm., 0.6 × 0.24 mm., 0.4 × 0.08 mm., 0.15 × 0.02 mm.

A fragmentary specimen from Station 260 is superficially different from the ordinary type in having the closely dovetailed external spindles of the coenenchyma much smaller, a common length being 0.4 mm., (whereas some of the Challenger specimens had spicules 2.4 mm. in length), and in having more prominent and irregular warts. It is to be noted, however, that this occurred along with a typical specimen of *K. koreni*. Still more striking is its occurrence along with *Telesto rubra*.

From Station 154 came two fragments, one (A), a typical piece of *Keroeides koreni*, the other, (B), obscured by a sponge growth, with the external spicules smaller and more varied in form. In fact they differ as did the specimens from Station 117 and Station 260. We have seen considerable variation in side and shape in one colony of *Keroeides koreni*. The longest heavily warted spindles from the two specimens from Station 154 had the following dimensions:

Specimen A: A maximum length of 1.05 mm. and breadth of 0.17 mm.

Specimen B: A maximum length of 0.5 mm. and breadth of 0.12 mm.

Previously recorded from Coast of Japan, Laccadive Islands.

Family Melitodidae.

Genus **Melitodes.**

1. *Melitodes esperi* Wright and Studer.

For description see: Wright and Studer, Chall. Report Alcyonaria, XXXI, 1889, p. 179, 1 fig.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 2 Ex.
Stat. 257. Du-roa-Strait, Kei-islands. Up to 52 M. Coral. 1 Ex.

Portions of a red colony with yellow polyps. The branching is reticulate in one plane, with a slight flattening of twigs. The polyps leave one surface almost quite free. There are numerous rough-headed pseudo-clubs, that is to say derivable from the spindle type. There are no clubs with "broad leaf-like processes", reported for this species by Stuart Thomson, Proc. Zool. Soc. London, 1911, p. 875.

Previously recorded from Torres Straits, Malay Archipelago, South Africa (?) and by Nutting from Siboga Stations 33, 50, 60, 80, 144, 164, 257, 273 and 315.

2. *Melitodes ochracea* (L.).

For description see: Kükenthal, Alcyonarien Aru- und Kei-Inseln, Abhandl. Senckenberg. Ges., XXXIII, 1911, p. 334, 8 figs.

Stat. 282. 8°25′.2 S., 127°18′.4 E. 27—54 M. Sand, coral and Lithothamnion. 1 Ex.

Fragments of a colony with red calyces and axis, and yellow cœnenchyma, agree thoroughly with the descriptions previously given. The spicules include warty spindles straight and bent, short big-headed warty pseudo-clubs, and smooth rodlets from the nodes.

Previously recorded from the Indian Ocean; and by Nutting from Stations 71, 85, and 234.

3. *Melitodes variabilis* Hickson.

For description see: Hickson, Fauna Maldives, 1903, p. 809, 1 fig.
Thomson & Simpson, Alcyonarians Indian Ocean, 1909, p. 169.

Stat. 105. 6° 8′ N., 121° 19′ E. 275 M. Coral bottom. 1 Ex.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 M. Sand, small stones and shells. 2 Ex.

Unsatisfactory fragments (from Station 164), are probably referable to this variable species. They are greyish, with a white axis. The spicules include: warty spindles often much bent, warty pseudo-clubs derived from the spindle-type, bent spindles with the warts much stronger on the convex side, and a few warty forms approaching the spherical.

Similar fragments from Station 105 show the same types of spicules, also numerous smooth rodlets.

Previously recorded from Maldives, Andaman Islands; also by Nutting from Siboga Stations 60 and 274.

Genus **Mopsella.**

1. *Mopsella spinosa* Kükenthal.

For description see:
Kükenthal, Alcyonarien Aru- und Kei-Inseln, Abh. Senckenberg. Ges., XXXIII, 1911, p. 343, 6 figs.
—— Wiss. Ergebn. Deutsch. Tiefsee-Exp. XIII, 1919, p. 160—161.

Stat. 273. Jedan Island. 2 Ex.

Two colonies with blood-red axis, not very closely anastomosed, one with canary-yellow polyps, and the other yellowish grey. The branches are cylindrical. The nodes are swollen, but not so much as in Nutting's figure of *M. spongiosa*. The spiculation agrees closely with Kükenthal's figures, and a notable feature is the occurrence of relatively large foliaceous clubs with numerous pointed projecting folia on one side. But there are also numerous smaller foliaceous clubs with a smaller number of more terminal folia.

Previously recorded from Malay Archipelago and North West Australia.

Genus **Wrightella.**

1. *Wrightella coccinea* (Ellis and Solander).

For description see: Nutting, Gorgonacea of Siboga-Expeditie, XIII b[5], 1911, p. 51.

Stat. 117. 1° 0′.5 N., 122° 56′ E. 80 M. Sand and coral. 1 Ex.

A fragment of a colony with a pink-red axis, yellow polyps, and yellowish pink coenenchyma agrees well with previous descriptions. Thus the polyps show eight points, each consisting of one horizontal spindle and two or three pairs in chevron. The most typical spicules are somewhat rounded foliaceous clubs with a tuberculate basal portion and a foliaceous, somewhat bud-like, externally projecting prominence.

Previously recorded by Nutting from the same Station. By others from Mauritius, Seychelles, Cape of Good Hope.

2. *Wrightella superba* Kükenthal. (Plate II, Figs. 1 and 3; Plate XXV, Fig. 7).

For description see: KÜKENTHAL, Wiss. Ergebn. Deutsch. Tiefsee Exp. XIII, 1919 p. 172.
NUTTING, Gorgonacea of Siboga-Exped. XIII b[5], 1911, p. 52.

Stat. 240. Banda. Reef.

A small fragment of this striking species from Banda shows the end of a branch with two internodes, each about 8 mm. in length, arising dichotomously from a node. Each of these forks again at the tip, the smallest twig reaching a length of only 3 mm. It agrees well with KÜKENTHAL's and NUTTING's descriptions. The calyces are somewhat smaller, however, very low and with a maximum diameter of 9 mm. They thickly cover the yellow branches on three sides, and show a conspicuous red colour. The polyps are all withdrawn. The armature of the polyp shows a collaret of 3—4 rows of spindles, from which arise 8 points of one pair of spindles in chevron. Above these the tentacle bears a mass of small rough platelets (Stachelplatten).

The spiculation agrees in every respect with the former descriptions, the small foliated types which arise from a very short base and resemble a closed bud, being the most characteristic.

Previously recorded from Malay Archipelago and by NUTTING from Banda, Kei islands, and Station 282.

Genus **Acabaria**.

1. *Acabaria formosa* Nutting.

For description see: NUTTING, Gorgonacea of Siboga-Exp. XIII b[5], 1911, p. 46, 3 figs.

Stat. 240. Banda. Reef.

Fragments of a bright yellow colour, with the red axis showing through, agree entirely with NUTTING's description and figures.

Previously recorded by NUTTING, Siboga Station 240, Banda, 9—45 fathoms.

2. *Acabaria ramulosa* Kükenthal.

For description see: KÜKENTHAL, Alcyonarien Aru- und Kei-Inseln, Abh. Senckenberg. Nat. Ges., XXXIII, 1911, 7 figs.

Stat. 105. 6° 8′ N., 121° 19′ E. 275 M. Coral bottom. 1 Ex.

A fragment of a colony, with slender branches, of a warm cream colour, 4.6 cm. by 2.8 cm., agrees well with KÜKENTHAL's *A. ramulosa*. Thus the specimen is branched in one plane; the branches arise at acute angles both from nodes and internodes; the polyps occur in lateral rows and have prominent calyces; the spicules are practically the same, e. g. curved and arcuate spindles, with warts sometimes rising into fangs, warty pseudo-clubs derived from the spindle type, almost smooth rodlets from the swollen nodes.

In contrast, however, to KÜKENTHAL's description, there is no anastomosis on this fragment.

Previously recorded from Aru Islands.

Sub-Order HOLAXONIA.

Family PLEXAURIDAE.

Genus **Euplexaura.**

1. *Euplexaura robusta* Kükenthal.

For description see: KÜKENTHAL, Japanische Gorgoniden, Abh. Bayer. Akad. Wiss. 1909, pp. 18—19, 5 figs.

Stat. 172. Gisser. 18 M. Coral- and Lithothamnion-bottom. 1 Ex.

A grey-brown fragment, 3 cm. in length with a stem diameter of 3 mm., agrees closely with KÜKENTHAL's description and figures of *Euplexaura robusta*. Thus the polyps show low but well-defined calyces with an 8-lobed margin, and a crown of three transverse rows bearing eight triangular points with 3—4 pairs of spindles converging in chevron. Beyond the tips of these triangles are seen the well-armoured retracted tentacles, as described by BROCH (Svenska Akad. Handl. LII, 1916) for *E. flabellata*, which we agree with KÜKENTHAL in regarding as synonymous.

Previously recorded from littoral region of N. W. Australia and Japan.

Genus **Paraplexaura.**

1. *Paraplexaura verrucosa* (Brundin).

For description see: BRUNDIN, Alcyonarien Zool. Mus. Upsala. Bihang Svenska Akad. 1896, XXII, p. 17, 2 figs.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.

A yellowish basal fragment of a colony shows the characteristic Plexaurid spicules, namely foliaceous clubs with warty divaricate base. Most of the folia have an entire margin, but some show strong ridges on the folium, and these may pass into folia with multiple points. A suppression of the foliar part and an expansion of the base gives rise to warty multiradiate plates. There are also many warty spindles. The axis is very slightly calcareous.

NUTTING notes that his *Echinogorgia flora* might be referred to the Plexaurids were it not that its axis is devoid of calcareous matter. But Plexaurids vary in this respect, and the spicule figured (Plate XXI, 10) is very definitely Plexaurid and like the foliaceous clubs of our specimen, which came from the same locality.

Previously recorded from Hirudo Strait, Japan.

Family MURICEIDAE.

Genus **Menacella.**

1. *Menacella reticularis* Gray.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 2 Ex.

To the not very satisfactory genus Menacella we refer two fragments of a greyish white colour from Station 164. One specimen bears two branches and its total height is 9.7 cm. The other is unbranched and has a length of 11 cm. The average diameter is 2 mm.

Although the specimens do not show any hint of being flabellate, still less of being reticulate, we refer them to the only described species, *M. reticularis*, which NUTTING has also reported from the Siboga Expedition.

The salient features are the following:

(1) the spicules are practically all spindles, of which three types may be distinguished:
   (*a*) a stout form, densely covered with compound warts;
   (*b*) a more slender form, probably in many cases a younger stage, with numerous simple warts;
   (*c*) a slender spindle, with attenuated spines;
(2) the closely adjacent calyces are low domes with eight triangular projections which close over the mouth and shut in the retracted cylindrical polyps;
(3) the axis is very delicate, black or golden brown in colour, and definitely calcareous.

Previously recorded by NUTTING from Station 28, Bali.

Genus **Elasmogorgia**.

1. *Elasmogorgia filiformis* Wright and Studer.

For description see: WRIGHT and STUDER, Challenger Report on Alcyonarians, 1889, p. 133.
NUTTING, Gorgonacea of the Siboga Expedition, Muriceidæ, XIIIb. 1910, p. 45.

Stat. 213. Saleyer. Up to 36 M. Coral reefs, mud and mud with sand. 2 Ex.

Two unbranched colonies of 23 and 24 cm. in length, with a diameter of 1.5 cm., unfortunately not well preserved. The spicules agree with previous descriptions. Those of the verrucæ stand mainly in upright double rows. Beyond these are sloping double rows converging towards the bases of the tentacles. The axis is golden yellow. The colony bears a number of minute rosette-bodies which are loosely attached and look like larvæ of some sort.

Previously recorded by NUTTING from Siboga Station 289, Timor Sea, and by WRIGHT and STUDER from Arafura Sea.

2. *Elasmogorgia filigella* n. sp. (Plate III, Fig. 1; Plate VII, Fig. 1; Plate XXV, Fig. 10).

Stat. 80. 2° 25′ S., 117° 43′ E. From 50—40 M. Fine coral sand. 1 Ex.

A delicate unbranched colony, 13.2 cm. in length, of a coral red colour, with distant polyps all on one side. An average interval is 7 mm. The polyps project for 1—2 mm. The flexible horny axis is non-calcareous, of a yellowish colour.

The bases of the polyps show a rather irregular arrangement of spindles, but this gives place to what can only be described as chevron. These are continued on to the bases of the infolded tentacles, which are creamy yellow at their tips.

The spicules show practical uniformity, being tapering spindles thickly covered with low conical warts, mostly simple. Some of the smaller forms are smoother than the majority. The following measurements were taken: 1.1 × 0.08 mm.; 0.75 × 0.08 mm.; 0.2 × 0.02 mm.

Note on Thesea, Pseudothesea and Acis.

(1) KÜKENTHAL in 1919 identified the genus Thesea of DUCHASSAING and MICHELOTTI with the genus Acis, laying stress apparently on the fact that the cœnenchyma of both is covered

with massive warty spindles. But according to KÖLLIKER (1865) there is a single layer in *Acis guadalupensis* Duch. and Mich., and two layers in Thesea, the inner one with smaller spindles.

(2) For forms which had been referred by NUTTING to the genus Thesea, KÜKENTHAL established the new genus Pseudothesea, which is marked by unilateral, high-thorned, plate-like, modified spindles, plus various other forms like clubs and thorns.

(3) But this unilateral development was emphasised in KÖLLIKER's definition of Thesea, with special reference to *T. exserta*, which KÜKENTHAL identified with *T. guadalupensis* and used in his Gorgonaria (1924) as the type of a re-instated genus Thesea, from which Pseudothesea is separated off because of its *unilateral* spindles! Thus he used as the distinctive feature of a new genus Pseudothesea, what was originally regarded as characteristic of Thesea. It seems to us, therefore, that Pseudothesea is not a well-defined genus and that NUTTING's species (Siboga XIII b) should retain the old name Thesea.

Genus **Thesea**.

1. *Thesea placoderma* Nutting.

For description see: NUTTING, Muriceidæ of the Siboga Exp. XIII b, 1910, p. 54, 3 figs.

Stat. unrecorded. 1 Ex.

A fragment of a brownish colour, 2.9 cm. in length, with a maximum diameter of 3 mm. The verrucæ are practically contiguous. The points of the crown and points consist of two heavy spicules sloping towards each other. The colourless spicules show (1) numerous unsymmetrical forms of the characteristic Thesea type with very large teeth on one side, (2) numerous rough stars with branched processes on all sides, (3) forms that approach the Acamptogorgia type with divaricate base and a projecting foliaceous spine which tends to be compound.

Previously recorded by NUTTING from Siboga Station 310.

2. *Thesea sanguinea* Nutting.

For description see: NUTTING, Muriceidæ of the Siboga Exp. XIII b. 1910, p. 55, 3 figs.

Stat. 240. Banda. 9—36 M. 1 Ex.

A fragment of a red colour, 2 cm. in length and 1.5 mm. in thickness, without any branching left. The cœnenchyma is covered with large very warty spindles, some with markedly unilateral prongs. There are other shapes — such as crosses and approximate stars. The low calyces have their margin surrounded by a circlet of blunt but prominent knobs.

Previously recordèd by NUTTING from Haingsisi, Siau Island, Aru Islands, and Sailus Besar, Paternoster Islands.

Genus **Acis**.

1. *Acis squamata* Nutting. (Plate V, Fig. 2; Plate XVI, Fig. 9).

For description see: NUTTING, Muriceidæ of the Siboga Exp. XIII b, 1910, p. 42, 3 figs.

Stat. 105. 6° 8′ N., 121° 19′ E. 275 M. Coral bottom. 1 Ex.
Stat. 251. 5° 28′.4 S., 132° 0′.2 E. 204 M. Hard coral sand. 1 Ex.

A minute fragment of an ivory white colony, consisting of two branches, the longer rising to a height of 1.9 cm., and having a breadth of 2.5 mm. Some of the huge plates have a length of 4.5 mm. and a breadth of 1.5 mm. The surface of the plates (1) is roughly granular and one margin often bears tooth-like projections. Some (2) show half the surface ridged and the other half roughly granular. In this type there is often (3) a drawing out of the ridged half into a tapering triangle with longitudinal ridges, almost suggestive of being frayed. (4) There are also some relatively small rough spindles, and (5) small discs with radiating blunt processes and a rough upper surface, culminating in a central boss-like cluster. A larger piece of this beautiful form from Station 251, rises to a height of 4.6 cm. and gives off nine short branches, the longer extending for 1.7 cm.

Previously recorded from Siboga Stations 65, 253, 305.

Genus **Muricella.**

1. *Muricella argentea* (Nutting) = *Versluysia argentea* Nutting. (Plate XXIII, Fig. 10).

For description see: NUTTING, Gorgonacea of the Siboga Exp. XIIIb, 1910, p. 40, 3 figs.
KÜKENTHAL, Gorgonaria (Das Tierreich) 1924, p. 173.

Stat. 289. 9°0′.3 S., 126°24′.5 E. 112 M. Mud, sand and shells. 1 Ex.

Several broken specimens, the largest piece being about 4 cm. in height, with an axis 1.5 mm. in breadth. There are numerous low calyces rising on all sides but tending to be lateral. The colour is white, with here and there a suggestion of brown. The axis is brown.

The opercular points consist of two long sloping spindles, sometimes with an extra one at the base. The collaret is a single row. The outer spicules of the calyx are massive and tend to overlap. Those of the cœnenchyma suggest Acis, in their size and massiveness; they are longitudinally disposed; and there are two distinct strata. NUTTING described spindles of 4 mm. in length; the largest here seen was 2.3 mm.

Most of the spicules are very tuberculate spindles, sometimes so much broadened that they approximate to discs. Some have the ends bifid or even trifid, and an irregular twisted form with double ends is figured. There are also smaller less densely tuberculate spindles, and a minority almost smooth. All are colourless, but the large ones are very opaque.

We follow KÜKENTHAL in including *Versluysia argentea* Nutting in the older genus Muricella, and may note that the polyps can be entirely retracted into the low calyces.

Previously recorded (NUTTING) from Siboga Collection, Timor Sea.

2. *Muricella ceylonensis* Thomson and Henderson.

For descriptions see:
THOMSON and HENDERSON, Report Ceylon Pearl Fisheries, 1905, p. 302, 1 fig.
THOMSON and SIMPSON, Alcyonarians of Indian Ocean, 1909, p. 249.
NUTTING, Gorgonacea of the Siboga Exp, XIIIb, 1910, p. 36.
GORDON, Notes on Muriceid Genera, Proc. Zool. Soc. 1926, p. 314.

Stat. 305. Kampong Menanga. Solor Strait. 113 M. Stony. 1 Ex.

Fragments of a brown colour, 3 mm. in maximum thickness, showing traces of branching

in one plane, seem referable to this species. The cortex is covered with very long twisted spindles, up to 4 mm. in length, very coarsely and regularly warted. The polyps are much retracted into depressions among the spindles; they show (*a*) a low calyx more developed on its lower lip, and consisting of spindles longitudinally arranged, sloping upwards at an acute angle; (*b*) a crown of 4—5 rows; and (*c*) well-developed triangular opercular points, each consisting of about four pairs of spindles in chevron.

We are inclined to think that *M. ceylonensis* should remain distinct from *M. ramosa* as Miss GORDON has emphasised, but that it should in the meantime remain in the genus Muricella, and not be referred, as NUTTING does, to the new genus Versluysia.

Previously recorded from Ceylon and by NUTTING from Stations 50, 260, 289 and 305.

Genus **Anthogorgia.**

1. *Anthogorgia annectens* n. sp. (Plate XXI, Fig. 10).

Stat. 237. 4° 2′ S., 129° 20′.3 E. 4507 M. Traces of dark grey mud. 1 Ex.

The features of the genus Anthogorgia are: the strongly projecting tubular verrucæ, with the absence of chevron-arrangement in the spindles of the verruca wall, the presence of a well-defined crown and points on the anthocodia, and the restriction of the spicules to stout spindles with compound warts.

The following species have been described:

A. divaricata Verrill.
A. japonica Studer.
A. verrilli Thomson & Henderson (1906) (non *A. verrilli* Nutting).
A. glomerata Thomson & Simpson.
A. racemosa Thomson & Simpson.
A. verrilli Nutting (1910) (non *A. verrilli* Thomson & Henderson).
A. aurea Nutting.

STUDER's *A. japonica* has not an anthocodial operculum and should be excluded from this genus.

A small damaged specimen of a greyish-brown colour, rising to a height of 4 cm., with an average branch thickness of 3 mm. There are some well-preserved polyps, and we are unable to refer the specimen to any of the described species. It comes nearest to *A. racemosa*.

Its features are the following:

(*a*) the prominent verrucæ, rising to a maximum height of 3 mm., have typically a regularly arranged spiculation of stout tuberculate spindles vertically disposed, dovetailed into one another, without hint of chevron, but sometimes with hints of rows;

(*b*) the typical operculum consists of a crown and points, two or three rows of horizontals forming the crown, while each point in the majority consists definitely of two pairs of spindles diverging in chevron fashion. In some cases there is a fifth spindle between the diverging bases; in other cases there are three pairs.

The spicules show a varying degree of roughness; (*a*) the majority are covered with coarse compound warts, very dense in some of the stouter forms, sparser in others; some of

these spindles are branched at the ends; (*b*) finer, narrower types, much less numerous and mainly from the operculum, are covered with simple conical, smaller projections.

The following measurements were taken:

Type (*a*) 1.1 × 0.2 mm.; 0.9 × 0.24 mm.; 0.8 × 0.15 mm.; 0.53 × 0.09 mm.;
Type (*b*) 0.7 × 0.06 mm.; 0.35 × 0.04 mm.

Genus **Acamptogorgia.**

1. *Acamptogorgia rubra* Thomson.

For description see:
THOMSON, Ceylon Pearl Oyster Fisheries, 1905, Supplementary Report No. XXVIII, p. 178, 2 figs.
NUTTING, Gorgonacea of the Siboga Expedition, XIIIb, 1910, p. 72.

Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 1 Ex.

The name Perisceles, given by WRIGHT and STUDER to the genus which they established, had been previously used for a beetle, and was for this reason replaced by Acamptogorgia in the Challenger Report. To this usage we adhere though KÜKENTHAL in his Gorgonaria (Das Tierreich, 1924) insists on re-instating Perisceles.

Of a small colony of this species, 4.3 cm. high, only the slender flexible horny axis remains, except for 2 cm. at the tip of one branch which is still covered with the cœnenchyma and polyps. It agrees very fully with THOMSON's description and figures.

The main stem forks about 3 mm. from the base into two main branches. On these the branching is alternate. The branch bearing the cœnenchyma has a diameter of 0.6 mm.

The verrucæ arise at right angles to the axis; a row of larger ones (average height 0.6 mm.) arises on each side, the calyces tending to an alternate arrangement. Between these rows on one surface are seen three or four much smaller calyces, as shown in THOMSON's text-figure. The cœnenchyma bristles with the sharp out-turned points of the typical large triradiate spicules. Some warty spindles are also found. These types are red in colour.

The armature of the polyp shows a typical Acamptogorgian arrangement, with 8 points consisting of a pair of longitudinal or sloping spindles and a third spindle lying horizontally at their base. These spindles (0.36 mm. long) are colourless and markedly frayed or dentate at both ends.

The colour of the axis is yellowish, cœnenchyma and polyps are crimson. This species is closely allied to NUTTING's *A. spatulata*, if not identical with it.

Previously recorded from Ceylon and by NUTTING as *Villogorgia rubra* from Siboga Stations 80, 81, 220.

Genus **Echinogorgia.**

1. *Echinogorgia aurantiaca* (Val.). (Plate XXII, Fig. 1).

For descriptions see: VERRILL, Notes on Radiata, 1867—71, p. 557.
NUTTING, Gorgonacea of the Siboga Exp., XIIIb, 1910, p. 62.

Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.

A fragment from Station 164, agrees well with NUTTING's description. It belongs to the

series where foliaceous spicules are the only forms that show on the surface, and where the verrucæ are low and rounded. The foliaceous expansions show marginal incisions.

An interesting developmental series can be clearly seen (see figures). (1) Apart from simple rough spindles, a common type — the Echinogorgia type — shows a rough divaricate base and a slightly foliaceous spine. (2) The foliaceous portion may become compound and keeled. (3) Many have an almost equal development of foliaceous portion and rough divaricate portion. (4) Then there is what may be called a dichotomy in development, for in some the tuberculate divaricate portion dwindles away, leaving a coarsely keeled thick plate. (5) But in others the foliaceous part dwindles away, leaving a flat tuberculate multiradiate, somewhat stellate disc.

Previously recorded by VERRILL from Callao, Peru; and by NUTTING from Siboga Stations 60, 164, 204.

2. *Echinogorgia complexa* Nutting. (Plate XXIV, Fig. 1).

For description see: NUTTING, Gorgonacea of the Siboga Exp. XIII b, part III, 1910, p. 67, 2 figs.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 3 Ex.

Three specimens from Station 310, agree with NUTTING's description. They are fan-like, reticulate, and of a pinkish brown colour. The verrucæ are low domes practically touching one another, and covered with foliaceous projections.

The predominant spicules are of the typical Echinogorgian type, showing a multiradiate divaricate portion bearing tubercles, and towards the exterior a considerable number of folia.

Some spindle-shaped forms have a slight foliaceous expansion on one side of the middle point; in some cases the foliaceous expansion is replaced by several strong fangs; in a few smaller forms the spindle is boomerang-like without fangs. This indicates a series, probably developmental as well as phyletic, connecting the spindle-type with the foliated expansions. The peculiarity in this species is the multiplication of forward-projecting foliaceous spines.

Starting from a spindle, we readily pass to one with a median slightly foliaceous expansion. This becomes dentate and leads on to the remarkable many fanged spindles, with the long fangs all on one side.

Starting again from a spindle, we find forms which bear on one half numerous projecting spinose prominences pointing in one direction, while the other half remains more warty. We may suppose the more warty half to spread out into the divaricate portion, while the other half forms the characteristic main spine of the Echinogorgias, with accessory foliaceous spines flanking it laterally. What happens seems to be that the accessory foliaceous spines become relatively stronger and crowd about the median spine, while the divaricate warty portion of the spicule becomes less and less noticeable until it is practically suppressed.

One of the specimens bears a calcareous Polyzoon colony about the size of a pea. Another shows, as in NUTTING's figure, a number of gall-like swellings with an apical aperture. Each is due to an affixed sessile barnacle, around the shell of which there is a complete yellowish investment evidently produced by the horny axis of the Alcyonarian. And outside this there is a continuation of the general cœnenchyma, including even verrucæ.

Previously recorded by NUTTING from the same Station.

3. *Echinogorgia pseudosassapo* Kölliker. (Plate V, Fig. 4; Plate XXV, Fig. 4).

According to KÜKENTHAL = *E. reticulata* (Esper).

For description see: WRIGHT and STUDER, Challenger Reports, Alcyonaria, 1889, p. 119, 2 figs.
NUTTING, Gorgonacea of the Siboga Expedition XIIIb, 1910, p. 64.
KÜKENTHAL, Gorgonaria (Das Tierreich, 1924) p. 202.

Stat. 164. 1°42′.5 S., 130°47′.5 E. 32 M. Sand, small stones and shells. 1 Ex.

A small colony standing 2.4 cm. high is referable to this species. The erect stem, arising from a small basal expansion, has a diameter of 2 mm. near the base, but swells towards the tip to a diameter of 2.5 mm. At a height of 11 mm. it gives off a branch 1 cm. in length. Both stem and branch are thickly covered with the closely packed calyces. The calyces are small and rounded, with an average diameter of 1 cm., and closely covered with the imbricating folia of numerous foliaceous clubs which give the surface a roughened appearance. These "Blattkeulen" are the most numerous of the cortical spicules, but there are in addition spindles of varying size. The smaller are covered with more or less equal compound warts; the larger are covered on one side with small dense warts and on the other with large foliaceous projections. Some of these larger spicules are triangular in shape and flattened. All the spicules are red.

The operculum is weakly developed; each point has a pair of converging fine spindles with occasionally a third at the base. The operculum does not project beyond the margin of the calyx, which in many cases is contracted so that only a small opening is left.

The following measurements of the spicules were taken:

(*a*) Foliaceous clubs with flattened folia arising from a warty base with a varying number of warty projections; 0.25 mm. in length, and 0.13 across the foliar end; 0.17 mm. in length and 0.1 mm. across the foliar end.

(*b*) Smaller straight or slightly curved spindles; 0.27 × 0.04 mm.; 0.18 × 0.03 mm.

(*c*) Heavy spindles with large foliar projections to one side, up to 0.6 mm. in length and 0.18 mm. in breadth.

The colour of the colony is a beautiful blood red, the polyps are cream-coloured, and the axis is dark brown.

Previously recorded from Torres-Straits, Ceylon, Malay Archipelago, and by NUTTING from Siboga Stations 80, 273, and 310.

Genus **Bebryce**.

1. *Bebryce indica* Thomson.

For description see: THOMSON, Ceylon Pearl Oyster Report, Alcyonaria, 1905, Appendix, p. 175, 1 fig.

Stat 310. 8°30′ S., 119°7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.

KÜKENTHAL (Gorgonaria, Das Tierreich, 1924) refers all but one species of Bebryce (including *B. indica*, *B. hicksoni* and *B. thomsoni*) to a new genus Pseudobebryce, characterized by its double discs and double spheres, which he holds to be absent in Bebryce, represented by *B. mollis*, which has calyx-shaped sclerites with rounded marginal processes. We cannot for a moment admit the legitimacy of this distinction, for *B. mollis* has the typical double disc-like or capstan-like cœnenchyma spicules as well as the more calyx-like forms.

An incomplete specimen, with few branches, rises to a height of 5.5 cm. It agrees closely with the description and figures of *Bebryce indica*. The superficial colour is brownish (whereas it was purplish-brown in NUTTING's specimens); the firmly built axis is olive brown and shows marked striæ running irregularly in a more or less longitudinal direction; the spicules are colourless and show the great variety of form previously figured.

We may add a note on the armature of the polyp, which is retracted into a rough dome-like calyx. The polyp spicules form a crown and points. The crown consists of about four horizontal rows of bent spindles, forming a well-marked collaret. Each point consists of spindles sloping in chevron, and the commonest number of pairs is three.

Previously recorded for the Siboga Collection by NUTTING from Stations 310 and 305. Previously recorded from the Gulf of Manaar.

2. *Bebryce hicksoni* Thomson and Henderson.

For description see: THOMSON and HENDERSON, Ceylon Pearl Oyster Report, Roy. Soc. London, N° XX, 1905, pp. 294—6, 2 figs.

Station 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 2 Ex.

A couple of fragments agree well with the original description.

Previously recorded by NUTTING from the same Station and from Stations 154, 257, 305, 310.

Previously recorded by THOMSON and HENDERSON from Ceylon

3. *Bebryce thomsoni* Nutting. (Plate XI, Fig. 2).

For description see: NUTTING, Gorgonacea of Siboga Exp. XIIIb, 1910, p. 49, 3 figs.

Stat 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand, with few pieces of dead coral. 1 Ex.

A stout upright roughly pinnate colony, rising to a height of 13.2 cm. in height, while NUTTING's specimen was only 5.7 cm. The maximum spread of our specimen is 7.1 cm., whereas NUTTING's was 3 cm. We have therefore to do with an older colony. The diameter of the main stem increases as it ascends, and the maximum is 4 mm., in contrast to NUTTING's 1.2 mm. But there is entire agreement as regards spiculation, colouring, and mode of growth. All the beaded, apparently spherical, spicules seem to have a very short stalk, and NUTTING's comparison to a rounded short-stalked mushroom is very apt.

Our specimen comes from Station 310, from which *Bebryce indica* Thomson was recorded by NUTTING, as well as *Bebryce hicksoni*; but the three species are readily distinguishable.

Previously recorded from Station 50, Flores, and Stations 258 and 260 Kei Islands.

Genus **Discogorgia.**

1. *Discogorgia bebrycoides* (Nutting). (Plate XV, Fig. 12).

For description see: NUTTING, Gorgonacea of the Siboga Exp., XIIIb, 1910, p. 81, 3 figs.
KÜKENTHAL, Gorgonaria (Das Tierreich) 1924, p. 214.

Stat. Unrecorded. 1 Ex.

A group of young white colonies rising vertically from a disc of attachment to a maximum height of 5 cm. There are no branchings of the third order. The ends of the branches

are slightly swollen. The branching is simpler than in the specimen described by NUTTING, and there are no anastomoses.

The calyces are practically contiguous and on all sides; their walls show large imbricated scales. The operculum consists of slender triangular points, consisting of two sloping spicules with a basal one between. The delicate collaret shows 2—3 rows of horizontal slender spindles.

The spicules include:

(*a*) very rough warty discs with toothed edges, some almost oblong, some almost circular;
(*b*) various sizes of rough spindles;
(*c*) some quadriradiates;
(*d*) small irregular forms.

We agree with KÜKENTHAL in including this species in his genus Discogorgia (1919) which differs from Placogorgia in the presence of warty disc-like spicules in the rind. In Placogorgia these are found only in the calyx.

Previously recorded from Postillon Islands, Aru Islands, and Flores Sea.

Genus **Heterogorgia.**

1. *Heterogorgia muricelloides* Nutting.

For description see: NUTTING, Gorgonacea of the Siboga Exp., XIIIb, 1910, p. 89, 3 figs.

Stat. 303. Haingsisi. Up to 36 M. Lithothamnion. 1 Ex.

A slender unbranched deep coral-red colony, 16 cm. in length, with a breadth of about 1.5 mm., with a yellowish brown axis. The calyces, which occur all round, are low truncate cones with vertical tooth-like projections round the margin.

The spicules are large sinuous spindles, very densely warted, sometimes with exaggerated tooth-like prominences on one side. Besides these there are numerous small stars, often with one salient projecting point as seen on the calyx. Small spindles also occur, sometimes with a slight median constriction or a crossing of lines.

Our specimen is evidently the same as that described by NUTTING and we retain his naming. It seems doubtful, however, whether the genus Astromuricea, well-defined by GERMANOS, and marked not only by stars but by double stars and wheels, and by a paucity of spindles, can be profitably merged in Heterogorgia.

Previously recorded by NUTTING from Siboga Station 47, Bima.

Family ACANTHOGORGIIDAE.

Genus **Acanthogorgia.**

1. *Acanthogorgia angustiflora* Kükenthal and Gorzawsky.

For description see: KÜKENTHAL, Japanische Gorgoniden, I, 1908, p. 58, 3 figs.

Stat. 254. 5°40′ S., 132°26′ E. 310 M. Fine grey mud. 2 Ex.

Two very young specimens, both 1.2 cm. high, agree well with KÜKENTHAL's description and figures of this species. In both the brown axis is very fully developed and quite distinct.

The well developed polyps arise on all sides of the stem and are very closely crowded in its upper portion, not sticking out at right angles to the stem, but growing upwards and tending to lie collapsed one on top of another. The polyps are large, up to 4.5 mm. in length. Their breadth measures about 1 mm., but the polyps are all compressed by preservation, and this measurement exceeds their true diameter. The polyp spicules are arranged in acute-angled chevron rows and the 'points' are quite distinct, consisting of smooth projecting spindles. These attain to 1.5 mm. in length, of which 0.3 mm. is a tuberculate portion and the remainder a smooth needle.

All the remaining types of spicule also agree well with KÜKENTHAL's figure. They are mainly bent spindles, covered rather sparsely with simple prominences. Some indeed are practically smooth. In the cœnenchyma are also found some rather irregular forms derived from the spindle type, including one or two forked forms approaching a triradiate.

The colour in alcohol is greyish-white with colourless spicules.

Previously recorded from Japan, 600 m.

2. *Acanthogorgia muricata* Verrill.

For description see:
VERRILL, Bull. Mus. Comp. Zool. XI, 1883, p. 34.
THOMSON & HENDERSON, Ceylon Pearl Oyster Report, Alcyonaria, 1905, p. 290, 1 fig.

Stat. 253. 5° 48′.2 S., 132° 13′ E. 304 M. Grey clay, hard and crumbly. 1 Ex.

A strong colony, somewhat bushy in its branching, rising to a height of 10 cm., agrees in all respects with previous descriptions.

Previously recorded by NUTTING from Station 260, also recorded by THOMSON and HENDERSON, from Indian Ocean, Trincomalee, and by HILES from Funafuti, Barbados, and Azores.

3. *Acanthogorgia striata* Nutting.

For description see: NUTTING, Gorgonacea of the Siboga Exp., XIIIb, 1910, p. 20, 3 figs.

Stat. 251. 5° 28′.4 S., 132° 0′.2 E. 204 M. Hard coral sand. 1 Ex.
Stat. 280. 8° 17′.4 S., 127° 30′.7 E. 1224 M. Dredge brought up glossy, black manganese nodules. 1 Ex.

A broken colony, with a golden amber axis, thickly beset with polyps on its upper portion, closely resembles *A. striata* Nutting and also *A. horrida* Studer. It rises to a height of 10.5 cm., and the polyp-bearing terminal portion has a breadth of 7 mm. The long spicules that project at the top of the calyx have smooth spines arising at an angle from the much tuberculated basal portion. No longitudinal striation was seen, but there are chevron rows on the wall of the calyx. There does not seem to be much difference between *A. striata* Nutting and *A. horrida* Studer. A fragment from Station 251 seemed to be referable to the same species, but no spicules were boiled out.

Previously recorded from Stations 117 and 253.

Family Primnoidae.

Genus **Thouarella.**

1. *Thouarella moseleyi* Wright and Studer.

For description see: J. Versluys, Primnoiden der Siboga Exp., XIIIa, 1906, p. 29, 3 figs.

Stat. 258. Tual, Kei-islands. 1 Ex.

A single specimen, considerably rubbed, 15 cm. long, with twigs mainly bilateral, agrees well with *T. moseleyi*, which Kükenthal referred to his new sub-genus Euthouarella (Gorgonaria 1924, p. 294.) The polyps are in pairs; the circumopercular sclerites show gradually tapering points; those below show some radial ridges, and there are five in an abaxial row.

Previously recorded from Kermadec Islands and Flores-sea, and by Versluys from Siboga Station 45.

Family Gorgoniidae.

Genus **Pseudopterogorgia.**

1. *Pseudopterogorgia pinnata* (Nutting) = *Lophogorgia pinnata* Nutting.

For description as *L. pinnata* n. sp. see: Nutting, Gorgonacea of the Siboga Exp. XIIIb[4], 1910, p. 3, 3 figs.

Referred to *Pterogorgia sibogæ* by Bielschowsky, Revision Gorgon. 1918, p. 62.

Referred to Pseudopterogorgia by Kükenthal, Gorgonaria (Das Tierreich) p. 357.

Stat. 273. Jedan-island. 1 Ex.

A small piece of branch, probably almost terminal, 5.7 cm. in length by 1 mm. in breadth, slightly flattened, of a white colour, with no protrusion of verrucæ. The spicules are very uniform, colourless spindles girdled with warts, the two median whorls being usually most conspicuous. The following measurements were taken: 0.12 × 0.02 mm.; 0.15 × 0.03 mm.

Previously recorded from Station 273, Anchorage off Pulu Jedan, East coast of Aru Islands, 13 metres.

Family Gorgonellidae.

Genus **Junceella.**

1. *Junceella racemosa* (Wright and Studer).

For description see: Simpson, Revision of Gorgonellidæ. Proc. Irish Acad. XXVIII, Section B, 1910, p. 300, 4 figs.

Stat. 166. 2° 28′.5 S., 131° 3′.3 E. 118 M. Hard, coarse sand. 1 Ex.

A fragment with two slender branches, the maximum length being 5 cm. It agrees with *J. racemosa* in its delicacy, in its thin cœnenchyma and thread-like axis, in the tendency of the polyps to occur in three rows, and entirely in its spiculation, which, however, tends to be very uniform in this genus. The general colour is brownish; many of the clubs are amber-yellow.

Previously recorded from off Japan and Andamans, and by Nutting from Siboga Stations 99, 164, 258, 260, and 310.

Genus **Nicella**.

1. *Nicella carinata* Nutting. (Plate II, Figs. 5 and 6).

For description see: NUTTING, Gorgonacea of the Siboga Exp., XIII b[3], 1910, p. 29, 3 figs.

Stat. 117. 1°0′.5 N., 122°56′ E. 80 M. Sand and Coral. 1 Ex.
Stat. 257. Du-roa-strait, Kei Islands. Up to 52 M. Coral. 1 Ex.

A fragment of a bleached yellowish brown colour, 2.9 cm. in height, with prominent calyces up to 1 mm. in height, agrees well with NUTTING's description and figures. Thus the spicules are of two main types, (*a*) minute yellowish double-heads densely tuberculate, and (*b*) larger colourless bars covered all over with minute roughnesses, but often showing a slight constriction at the waist. The polyps have an unusual dark chocolate colour.

A sub-flabellate colony from Station 117, 3.5 cm. high with a maximum spread of 1.5 cm., is of a more definite golden brown colour, but the polyps show the same deep chocolate colour. All the polyps are firmly retracted within the closed calyces which appear rather lower and more flattened than in the former specimen, about 0.6 mm. high and 1.3 mm. broad. They arise alternately except at the tip of a twig where they are nearly opposite. The spicules show the two main types, small yellow double heads and larger colourless bars, both densely tuberculate.

Previously recorded by NUTTING from these and other Stations.

2. *Nicella dichotoma* Gray.

For description see:

THOMSON and RUSSELL, Alcyonarians collected on the Percy Sladen Exp.; Trans. Linn. Soc. XIII, 1909, p. 161, 2 figs.
Also SIMPSON, Revision of Gorgonellidæ. Proc. Irish. Acad. XXVIII, 1910, p. 363, 1 fig.

Stat. 117. 1°0′.5 N., 122°56′ E. 80 M. Sand and coral. 1 Ex.
Stat. 204. 4°20′ S., 122°58′ E. From 75—94 M. Sand with dead shells. 2 Ex.

Two grey-brown specimens from Station 204, the larger with a height of 16 cm., agree entirely with the descriptions given by GRAY and by THOMSON and RUSSELL. Characteristic features are: The branching is in one plane, dichotomous, and without anastomosis; the surface of the cœnenchyma shows irregular wavy ridges, producing a bark-like appearance; the verrucæ are very prominent, arising at right angles to a height of about 2 mm. A fragment shows a Cirripede gall, as on the THOMSON and RUSSELL specimen.

The spicules are of two main types: (*a*) double heads and occasional double stars, the difference NUTTING makes being that the double stars have more prominent radiating points, whereas double heads have close-set knobs; and (*b*) larger spindle-types, mainly rough all over, mostly typical spindles, but occasionally with a hint of a median waist. A few relatively smooth spindles occur and there is an occasional cross.

We agree with SIMPSON in the provisional retention of the genus Nicella because of the larger spindle-types of spicules.

A small fragment from Station 117 has a height of 6.4 cm.

Previously recorded from Salomon, Chagos Archipelago; and from Mauritius.

Family Isidae.

Sub-family Isidinae.

Genus **Isis.**

1. *Isis hippuris* L. (Plate V, Fig. 3).

For description see: Thomson and Simpson, Alcyonarians of Indian Ocean, 1909, p. 181—191, 3 figs.

Stat. 258. Tual-anchorage, Kei-islands. Reef. 1 Ex.
Stat. 303. Haingsisi. 36 M. 1 Ex.

A small colony of this well-known species, rising to a height of 4 cm. with an average breadth of 3 mm. There is an expanded cup-shaped base, evidently fitting over a substratum, and there is some hint of a basal branch having been broken off. The specimen seems in every way typical; the spicules are very characteristic.

A fragmentary specimen from Haingsisi is also typical.

Previously recorded from Pacific Ocean, Indian Ocean, Mediterranean Sea, America, North Sea, Iceland, Antilles, Straits of Sunda and Southern Coast of Sumatra, East Indies, and Amboina.

Also from Siboga Stations 71, 133, 142, 144, 149, 258, 279, 301, and 303.

Sub-family Muricellisidinae.

Genus **Muricellisis.**

1. *Muricellisis cervicornis* n. sp. (Plate VII, Fig. 8; Plate XXI, Fig. 12).

For description of genus see: Kükenthal, Wiss. Ergebn. Deutsch. Tiefsee Exp. XIII, 1919, p. 626, 6 figs.

Stat. 139. 0° 11′ S., 127° 25′ E. 397 M. Mud, stones and coral. 1 Ex.

An interesting fragment of a whitish colour, with faintly yellow nodes, is referable to Kükenthal's little known genus Muricellisis for the following reasons:

(1) the long amorphously calcareous internodes are separated by short partly horny nodes (thus indicating Isidæ);
(2) the polyps are retractile into low calyces (thus excluding Ceratoisinae and Mopseinae);
(3) the polyp spicules are very rough spindles, and not small warty irregular bodies (thus excluding Isidinae).

Our specimen agrees then with Muricellisis in the following points: the polyps are retractile, and show a distinct calyx; the sclerites are very rough spindles. In more detail, the internodes are long, e. g. 1 cm., with fine sloping striation, thumb-print-like; the nodes are very short, about 2 mm.; the calyces arise all round; their wall is supported by irregularly arranged, yet on the whole longitudinal spindles; the armature of the polyp consists of eight double rows (often 2—3 pairs) of sloping spindles, rising from a horizontally disposed crown of 2—3 rows; the tentacles are well armoured and form a pseudo-operculum.

We cannot refer our specimen to KÜKENTHAL's species for the following reasons:

(*a*) the branching is antler-like, not sparse;

(*b*) the internodes are solid, not hollow;

(*c*) the cortex cannot be called thick.

Yet the spiculation seems practically the same, consisting mainly, on the more superficial regions, of very rough straight and bent spindles, occasionally pseudo-clubs.

The strongest piece has a basal breadth of 5 mm., and rises antler-like to a height of 3 cm. The calyces stand out to a height of about 0.5 mm., and about six occur in one line on the distance of one centimetre.

Order TELESTACEA.

Genus **Telesto.**

1. *Telesto arborea* Wright and Studer. (Plate XI, Figs. 4 and 6).

For description see: WRIGHT and STUDER, Challenger Report, 1889, XXXI, p. 262, 2 figs.
LAACKMANN, Zur Kenntnis der Alcyonarien Gattung Telesto. Zool. Jahrbücher, 1908, Supplement XI, p. 88, 2 figs.

Stat. 15. 7° 2′.6 S., 115°23′.6 E. 100 M. Fine coral sand. 1 Ex.
Stat. 47ª. Bay of Bima. 250 M. 1 Ex.
Stat. 99. 6° 7′.5 N., 120° 26′ E. 16—23 M. Lithothamnion bottom. 1 Ex.
Stat. 117. 1° 0′.5 N., 122° 56′ E. 80 M. Sand and Coral. 1 Ex.
Stat. 162. Salawatti. 18 M. Coarse and fine sand with clay and shells. 2 Ex.
Stat. 163. Selee Strait. 29 M. Sand and stone, mixed with mud. 1 Ex.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 M. Sand, small stones, and shells. Numerous, many broken Ex.
Stat. 258. Tual, Kei-islands. 22 M. Lithothamnion; sand and coral. 2 Ex.
Stat. 273. Jedan Island. 1 Ex.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 M. Sand and shells; stones. 1 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 15—30 fathoms. Sand, coral, and Lithothamnion. 3 Ex.
Stat. 288. 9° 0′.5 S., 126° 31′.2 E. 869 M. Hard; not obtained. 1 Ex.
Stat. 310. 8° 30′S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.
Stat. 315. Sailus Besar, Paternoster-Islands. Up to 36 M. Coral and Lithothamnion. 2 Ex.
Brandewijns Bay, Museum Amsterdam, SLUITER leg. 1 Ex.
Stat. Unrecorded. 1 Ex.

In this well-known species the longitudinal furrows are clearly defined, but narrow; the spicules are colourless and form a coherent skeleton; the stems tend to be upright; the walls are thin; the lateral polyps arise in all directions. Branching may occur to the fourth order. A colony with three main axes, rising to a height of 4.6 cm., differs from the type in its very slight branching, but this is probably due to its youth.

The spicules include:

(1) delicate spindles almost smooth, 0.5—0.6 × 0.02 mm.;
(2) delicate spindles with a few low distant prominences, 0.5 × 0.02 mm.;
(3) broader spindles with long prominences often compound, 0.3 × 0.03 mm., and 0.5 × 0.05 mm.;
(4) short brackets, that is to say, rods bearing at each end a process almost at right angles and to the same side, 0.15 × 0.03 mm.;
(5) short, delicate, smooth rodlets, probably from the distal part of the polyps.

Specimens from Station 288 show occasional anastomosis. In specimens from different stations there are slight differences in the proportions in which the various types of spicules occur; and the warty spindles of type (3) are more substantial in some specimens than in others.

The specimen from Station 315 arises from the branched base of a thick Gorgonid axis, bearing several kinds of Polyzoa, small Balanids, hydroids and sponges, in a crowded tangle.

In a single stem from Station 274, along with some young colonies, the general appearance is like *T. arborea*, e. g. in the narrow deep grooves, but the short interlocking spicules are more substantial and much more densely covered with compound warts than in any other specimen we have seen, though they are approached by specimens from Station 163. The stout very warty spicules are like the most warty forms in *T. smithii*, with which, however, the specimens do not otherwise agree.

Fragments from the Amsterdam Museum, (Brandewijns Bay, 1888) deposited by Prof. M. WEBER, are referable to *T. arborea*. Thus they show narrow well-defined grooves (in parts of the colonies); the branching is on all sides; the spiculation is typical.

A colony from an unknown station is interesting in being so thickly covered with sponge that its real nature is thoroughly masked. A piece of this has been drawn. Anastomosis of branches occurs, and this is apart from binding together with sponge. The spicules are like those of a typical *T. arborea*. When the sponge is scraped away deep narrow longitudinal grooves are seen. At the base of one of the stems there are two or three beautiful small Ophiuroids, marked by delicate blue lines.

Previously recorded from Arafura Sea, Zanzibar, Amboina, Sydney.

2. *Telesto multiflora* Laackmann.

For description see: H. LAACKMANN, Zur Kenntnis der Gattung Telesto, Zool. Jahrb., 1908, Supplement 11, p. 91, 1 fig.

Stat. 315. Sailus Besar, Paternoster-islands. Up to 36 M. Coral and Lithothamnion. 1 Ex.

Several undivided stems with very numerous lateral polyps, a distinctive feature. The longest stem is 12.8 cm., with a diameter of 2 mm. The polyps project all round to a height of about 2.4 mm.; and there are about eight to a centimetre. The longitudinal striping is recognisable, but not very definitely; the whole surface is masked by a sponge. The spicules are colourless, somewhat delicate, with little branching, but bound together, in varying degrees of compactness, by irregular prominences which vary from simple cones to blunt rugged processes. There are two distinct types of spicules, (*a*) delicate elongated rods sometimes forked at the end, with simple prominences, and (*b*) shorter, broader, much rougher, forms.

Previously recorded from Bass Strait, Sharks Bay.

3. *Telesto prolifera* (W. Koch).

For description see: LAACKMANN, Zool. Jahrb. 1908, p. 86, 1 fig.

Stat. 77. 3° 27′ S., 117° 36′ E. 59 M. Fine, grey coral sand. 4 Ex.
Stat. 117. 1° 0′.5 N., 122° 56′ E. 80 M. Sand and coral. 1 Ex.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 M. Sand, small stones and shells. 2 Ex.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 1 Ex.

A number of stiff upright stems (from Station 77), much covered with sponge, rising to a height of 13 cm., sparsely branched, with secondary polyps irregularly disposed. A common length for a secondary polyp is 3—5 mm. There are inconspicuous longitudinal grooves, obscured by the sponge. The spicules are chiefly, (*a*) slender, irregularly knobbed, long spindles; (*b*) shorter spindles or rods with proportionately long interlocking projections; (*c*) what might be called "antler-like", i. e. much spread-out types with few but long projections.

Other cream-white specimens from other stations show stems rising to 9.2 cm. All agree with *T. prolifera* in the thin walls of the stem, the inconspicuous grooving, and the spiculation; but the numerical proportions of the different spicules vary considerably.

Besides sponges, the colonies show several Polyzoa (one pink in colour), and small reddish Balanids near the apex.

Formerly recorded from Sumatra, Manilla, Singapore.

4. *Telesto rubra* Hickson. (Plate III, Fig. 4; Plate V, Fig. 1; Plate VI, Figs. 1, 2, 3 and 4; Plate VII, Fig. 6; Plate XXV, Fig. 2).

For description see: HICKSON, Alcyonaria of Maldives, 1903, p. 480, 6 figs.

Stat. 60. Haingsisi near Timor. 23 M. Lithothamnion in 3 M. and less. Reef. 1 Ex.
Stat. 133. Salibabu-island. 36 M. Mud and hard sand. 1 Ex.
Stat. 144. Damar. 45 M. Coral bottom and Lithothamnion. 1 Ex.
Stat. 204. 4° 20′ S., 122° 58′ E. 75—94 M. Sand with dead shells. 2 Ex.
Stat. 220. Binongka. 55 M. Coral sand. 1 Ex.
Stat. 257. Duroa-Strait, Kei-islands. 52 M. Coral. 2 Ex.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 M. Sand, coral and shells. 3 Ex.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. 112 M. Mud, sand and shells. 1 Ex.
Stat. 305. Solor Strait. 113 M. Stony. 1 Ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 M. Sand with few pieces of dead coral. 1 Ex.
Stat. Unrecorded. 1 Ex.

A slightly curved stem, giving off a secondary twig, and bearing altogether 33 verrucæ, 30 on the main stem, which rises to a height of 4.5 cm. There are remains of a delicate yellowish sponge. The 'verrucæ' project at right angles and the common size is 1—1.5 mm. The colour is pinkish red. The main stem is marked by eight longitudinal ridges.

To previous descriptions we may add some details in regard to the spicules.

There is a compact interlocking and fusion of strongly warted spindles. One type is relatively broad, 0.2 mm. in length by 0.1 mm. in breadth, bearing very obtuse but rough knobs. Another type is relatively narrower, 0.2 mm. in length by 0.05 in breadth, and with higher prominences. There are also some rough spindles tapering at one end, so that a sort of club results. Other spindles are bifurcate at one end.

Quite different are more delicate and more faintly coloured irregular forms, such as curved triradiates, hockey clubs, rodlets divided at each end into two, and brackets.

An interesting very young colony from Station 260 consists of two polyps united by a basal stolon. The longest polyp rises to a height of 3.5 mm. and a common breadth of the stolon is 0.6 mm. It is noteworthy that in these very young polyps the fusion of spicules into a tube is already very thorough. Most of the fused spicules are somewhat compact irregular

bodies, but, longer forms also occur. As HICKSON states, there are also a few free spindles from the anthocodia. The colour is pale yellowish red.

A very pale rose-coloured fragment was obtained from Station 260 and another very pale rather yellow-pink fragment from Station 289.

Previously recorded from Maldives, Rutland Is., Andamans, Ceylon.

5. *Telesto rupicola* (F. Müller).

For description see: H. LAACKMANN, Zool. Jahrb. 1908, p. 81, 4 figs.

Malacca Strait Houk Perlak. Depth 62 m., Cable, laid June 1892; rç. Dec. 1908. G. K. S. Telegraph V. N. 1 Ex.

A vigorous colony of upright stems, rising to a height of 10 cm. Only a few of them give off secondary branches. The longitudinal grooves are of the broad shallow type. There is but little indication of a coherent skeleton near the tip of the stem. The spicules are of two main types: (*a*) long narrow spindles with few projections, and (*b*) shorter, relatively more robust spindles with numerous prominent projections.

Previously recorded from Rio de Janeiro, Bahia, New Britain, Zanzibar.

Not determinable.

A number of specimens are too fragmentary and often too much encrusted to admit of secure identification.

(1) Thus some unbranched fragments from Station 315, Paternoster Islands, are not far removed from *T. arborea*, but the rod-like spicules with few warts tend to be distinctly longer and often show a bifurcate, hay-fork-like end.

(2) Other unbranched fragments from Station 285 near Timor are marked by the delicate wall of the stem, and closely approach *T. prolifera* in their spiculation.

(3) A single piece, standing stiffly to a height of 3.2 cm., giving off secondary polyps on four sides, with deep longitudinal grooves, is marked by the length and delicacy of its free spindles (up to 0.65 mm. in length). Most of the interlocking spicules are also longish, relatively narrow spindles. It probably approaches *T. africana* Verrill.

Genus **Coelogorgia.**

1. *Coelogorgia palmosa* (Val.).

For description see: WRIGHT and STUDER, Challenger Alcyonarians, 1899, p. 266, 8 figs.

Stat. 258. Tual, Kei-islands. Numerous, broken Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 M. Sand, coral and Lithothamnion. 1 Ex.

Large but much broken specimens of this well-described type, which differs from Telesto in having no horny substance in the stem, in having simpler, non-coalescent spicules, in the absence of 8 regular longitudinal ridges and grooves on the outside of the stem, and in having entirely non-retractile polyps.

A common diameter of the base of a main stem is 8 mm., but the largest basal piece has a diameter of 11 mm., both figures exceeding any previously recorded. The height of the

colony could only be inferred, but it seems to have been at least 30 cm., in contrast to the 17 mentioned in the Challenger Report. Wavy longitudinal lines on the main stems correspond to the large internal canals.

Previously recorded from Zanzibar.

Genus **Pseudocladochonus.**

1. *Pseudocladochonus mosaica* n. sp. (Plate XV, Figs. 5 and 9; Plate XXVII, Fig. 7).

Stat. 289. 9°0′.3 S., 126°24′.5 E. 112 M. Mud, sand and shells. 1 Ex.

To this interesting genus we refer a remarkable small specimen, 2.6 cm. high, which unfortunately, owing to its brittle nature, was broken. It shows a stem with a maximum diameter of 2 mm., which divides at the base into two approximately equal broken branches which carry two or three secondary branches with polyps. Three anastomoses are seen between two slender parallel branches which have a diameter of 0.75 mm. The polyps stand out at an acute angle to a height of 1.8 mm. measured along their mid-line. They have a basal diameter (measured at right angles to the polyp axis) of 0.55 mm., narrowing to 0.35 mm. at the apex. On the surface of the branches and polyps, but not of the basal stem, are seen eight clear longitudinal grooves. The entire surface of stem, branches and polyps is covered with a remarkable mosaic of broad warty plate-like spicules, oblong in shape, though varying to almost circular, which are firmly united together by the interlocking of their irregular dentate margins. The interlocking reminds one of the sutures of some skull bones. Many of these pavement spicules are so thin and flattened that they approach the scale type.

The mosaic spicules include the following forms:

(*a*) almost oblong, very warty, thick plates, with truncate or rounded ends, and interdigitating marginal processes, sometimes frayed. Average dimensions are 0.6 mm. × 0.14 mm.;

(*b*) a few triangular forms, with broad bases, tapering to an apex. The average length is 0.4 mm., with a basal breadth of 0.15 mm.;

(*c*) Shorter forms of the (*a*) type, sometimes approaching squares. Average dimensions are 0.25 mm. × 0.15 mm.;

(*d*) forms with a median waist, not far from the type figured by Kinoshita (Annot. Zool Japon. VII, 1909, Plate III, fig. 3). The average length is 0.28 mm., and the greatest diameter 0.17 mm.

Internal to this outer layer of spicules there lie narrow delicate irregular rods, such as are characteristic of some Telestos. More numerous are coarser branched forms more densely covered with compound warts. Some of this type are narrow and more flattened, with dentate margins. A small amount of a horny substance lies in the internal canal walls between the spicules. The longest internal warty rod measured 0.75 mm. So dense is the internal spiculation that at first glance the specimen would seem to belong to the Scleraxonia with an axis of fused spicules. By closer examination, however, and from sections made from our somewhat scanty material, we were convinced of the presence of eight central canals, with which the cavities of the polyps communicate, the canal walls being densely filled with spicules. On these grounds we must refer the species to the genus Pseudocladochonus, regarding the stem, branches and polyps as primary, secondary and tertiary zooids.

2. *Pseudocladochonus versluysi* n. sp. (Plate II, Fig. 7; Plate XXV, Figs. 9a and 9b).

Stat. 144. Damar-Island. 45 M. Coral bottom and Lithothamnion. 1 Ex. and fragments.

The specimens of this very interesting form have the following dimensions. The largest seems to be a nearly complete colony, 2.1 cm. high, with a maximum breadth of 2.5 mm. It has two broken branches and four calyces of its own. Two other pieces, the tips of a colony or colonies, show a stem breadth of 2 mm., and a calyx breadth of 2.5 mm. The colour is warm cream at the base and passes gradually into rosy pink. The pieces are quite rigid, but readily broken. With a lens, the texture of the surface is seen to be rough, with longitudinally disposed spindles fitting closely.

The specimens differ from those so carefully described by VERSLUYS in the following respects:

Ps. versluysi n. sp.	*Ps. hicksoni* Versluys.
a. Colour, cream to rose.	*a.* Colour white.
b. Much more robust in build, the calyces having a breadth of 2.5 mm., the stem less.	*b.* Calyces with a breadth of 1 mm., the stem less.
c. The polyps do not show a zig-zag arrangement, but are close together at the end of the larger specimen.	*c.* The polyps are very markedly alternate, producing a zig-zag appearance.
d. The spicules of the general cortex and calyx are large rough spindles without forking. A few show an acute, not spreading, bifurcation at one end. Their breadth is on an average 0.3 mm. The spindles of the cortex are extremely rough, entirely covered with warts and prominences. In many cases one side of the spindle shows longer smooth prominences, while the other side is covered with small compound warts. A spindle often passes towards a pseudo-club, gradually tapering from an acute to an obtuse end. On the calyx there are derivatives of the spindle type with an asymmetrical irregular expansion at the broad end.	*d.* The spicules are characteristic rods, forked or branched at their ends. A common breadth is 0.15 mm.
e. The compound warts of the spindles fit closely into one another, but there is no fusion.	*e.* There is actual coalescence of the forked rods.
f. The largest tentacular sclerites — flat spindles with one end forked or expanded — reach a length of 0.3 mm. There are also quite simple tentacular spindles.	*f.* The largest tentacular spindles — flat needles sometimes forked terminally — are 0.18—0.22 mm.

A Fragment like Pseudocladochonus.

Stat. 144. Damar-island. 45 M. Coral bottom and Lithothamnion.

An interesting fragment, suggestive of Pseudocladochonus, was too minute to allow of satisfactory examination. It is Telestid-like in its tubular character, but there is no indication of

a distinction between axial and secondary polyps. The main curved portion, 2.1 cm. in length, with a diameter of 0.7 mm., gives off a branch, 1.4 cm. in length.

The fragment has a relatively thick wall of interlocked spicules, and with a hint of internal longitudinal partitions. The outer wall consists of substantial spindles more or less closely dovetailed. They are densely rough with interlocking warts, often compound, and may remain coherent after boiling with caustic potash. In the interior there are more delicate smaller rodlets, nearer the Telestid type, which also remain coherent after boiling. Some of these are bluntly forked at the ends, and have longish irregular roughnesses.

The verrucæ are but slightly salient; one that we opened showed the retracted tentacles with spicules.

The general colour is whitish, but here and there, especially at the bases of the verrucæ, there are patches of rosy spindles, mostly of the smaller type.

The specimen seems to us to be at any rate near *Pseudocladochonus hicksoni* Versluys, a specimen of which was obtained from the same Station. Curiously enough a specimen of the very different, though somewhat convergent, *Telesto rubra* Hickson was also collected at this Station.

Fragments near Anthothela.

Stat. 284. 8° 43′.1 S., 127° 16′.7 E. 828 M. Grey mud. 1 Ex. Fragments.

Several tantalising fragments of a young Scleraxonian colony of a grayish-brown colour, over-crusted with debris. The longest piece is 1.7 cm. in length. There are traces of an encrusting habit.

The salient features are the following:

(1) the whole surface is provided with massive very warty spindles, sometimes interlocking. These sometimes become pseudo-clubs, or almost oblong. There are a few triradiates and irregular forms. In the axis the spicules are mainly warty spindles, but many of them are delicate and slender;

(2) the relatively thin rind is readily separable from the medulla and the latter shows nutritive canals;

(3) the long tentacles, infolded at the mouth, are very heavily armoured with large longitudinally disposed spindles;

(4) the long polyps seem to show a low calyx and an apparently non-retractile body. This shows somewhat irregular longitudinal rows of spindles, ending in eight massive points below the bases of the tentacles. But only two polyps were clearly visible.

The specimen seems to us near Anthothela, but does not belong to either of the described species.

Appendix to Sympodium. (Plate III, Fig. 7).

A very interesting young colony spreading on a little stone, with about 8 polyps on a ribbon-like stolon (0.5 mm. across), bears a striking but superficial resemblance to *Sarcodictyon catenata* Forbes, to which, however, it cannot be referred. For the spicules consist largely of spindles, narrow and tuberculate, along with a felted mass of irregular knobbed forms, some

rather rotund, others tending towards scales. These irregular knobbed forms cover the stolon, while the narrow spindles occur as a crown and points on the polyps. The single specimen is so small that we have refrained from giving it a name. It seems to us like a very young stoloniferous stage of a type allied to Erythropodium or Sympodium.

Deceptive Fragments. (Plate XXI, Fig. 8).

Stat. 60. Haingsisi. Reef. 1 Ex.
Stat. 81. Sebangkatan, Borneo-bank. 34 M. Coral bottom and Lithothamnion. Several Ex.

Several badly preserved fragments of a pronounced white colour, with a marked suggestion of shrunken Alcyonium or Lobularia colonies, and showing on some of the zooids eight tentacles (non-pinnate however), turn out to be compound Tunicates, not far removed from Sarcodidemnoides. The calcareous spicules, minute tuberculate spherules, are more refractive than those of Alcyonarians; as an instance of deceptive convergence we have figured a few.

(Plate XXI, Fig. 1).

Stat. 227. 4° 50′.5 S., 127° 59′ E. 2081 M. Grey mud with an upper layer of brown mud, both mixed with sand. 1 Ex.

Another interesting fragment is at first glance suggestive of a piece of an Anthelia. Most of the beautiful spicules are broad, very thorny rods and substantial crosses, the thorns being sharp, outstanding and densely crowded. There are also slender rodlets and crosses, with inconspicuous or less conspicuous roughness. But the spicules are exceedingly refractive and certainly not calcareous. They are doubtless the siliceous spicules of some sponge. We have figured a few.

ERRATA.

Reconsideration leads us to withdraw *Sinularia tentaculata* n. sp., Plate XVI, fig. 8, and List of Species, p. 4, in favour of *Sinularia flexibilis* (Q. G.).

We must also withdraw *Siphonogorgia flavorubra* n. sp. Plate XXV, fig. 11, leaving it simply Siphonogorgia (?)

LITERATURE REFERRED TO.

1900. ASHWORTH, J. H., Report on the Xeniidae collected by Dr. WILLEY. Willey's Zoological Results. Part 4. Quart. Journ. Micr. Sci. Vol. XLII.

1929. BIELSCHOWSKY, E., Die Gorgonaria Westindiens. Die Familie Gorgoniidae. Zool. Jahrb. Supplement XVI.

1895. BOURNE, G. C., On the structure and affinities of *Heliopora coerulea* Pallas, with some observations on the structure of Xenia and Heteroxenia. Phil. Trans. Royal Soc. London. Ser. (B) Vol. 186.

1900. —— On the Genus Lemnalia Gray with an account of the branching-systems of the order Alcyonacea. Trans. Linnean Soc. London, Ser. 2, Vol. VII.

1916. BROCH, H., Results of Swedish Scientific Expeditions to Australia. Svenska Akad. Hand. Bd. LII, 11.

1896. BRUNDIN, J. A. Z., Alcyonarien aus der Sammlung des zoologischen Museums Upsala. Bihang Svenska Akad. Handl. Bd. XXII, Afd. 4. N° 3.

1898. BURCHARDT E., Alcyonaceen von Thursday Island und von Amboina, II, Denkschr. med.-nat. Ges. Jena, Vol. VIII. Semon, Zool. Forschungsreisen, Vol. V.

1928. CHALMERS, D., The Alcyonarian Genus Siphonogorgia, with Descriptions of New Species. Proc. Royal Phys. Soc. Edinburgh. Vol. XXI, Pt. 4.

1927. DEAN, L. M. I. The Genus Hicksonia. Proc. Royal Phys. Soc. Edinburgh. Vol. XXI. Pt. 3.

1901. DELAGE, Y. et HÉROUARD, E., Traité de Zoologie Concrète, vol. II, Part II.

1788—1797. ESPER, E. J. C., Die Pflanzenthiere in Abbildungen nebst Beschreibungen. Nürnberg.

1926. GORDON, ISABELLA, Notes on Muriceid Genera. Proc. Zool. Soc. London.

1862. GRAY, J. E., Description of Two new Genera of Zoophytes (Solenocaulon and Bellonella). Proc. Zool. Soc. London.

1870. —— Notes on some new genera and species of Alcyonoid Corals in the Brit. Museum. Annals and Mag. Nat. Hist., Ser. 4, Vol. V.

1908. HARRISON, R. M., Some new Alcyonaria from the Indian and Pacific Oceans. Journ. Linn. Soc. London (Zool.) Vol. XXX.

1898. HENTSCHEL, E., Gorgonacea von Amboina und Thursday Island. Denkschr. med.-nat. Ges. Jena. Vol. VIII. Semon, Zool. Forschungsreisen, Vol. V.

1883. HICKSON, S. J., The Structure and Relations of Tubipora. Quart. Journ. Micr. Sci., XCII.

1886. —— Preliminary Report on certain Zoological Observations made at Talisse Island, North Celebes. Proc. Roy. Soc. London. Vol. XL.

1894. —— A Revision of the Genera of the Alcyonaria Stolonifera. Trans. Zool. Soc. London, vol. XIII.

1900. —— Alcyonaria and Hydracorallinae of the Cape of Good Hope. Pt. 1. Marine Investigations in South Africa, Vol. I, N° 5.

1903. —— Alcyonaria of the Maldives. Fauna and Geogr. Maldive and Laccadive Archipelagoes, vol. II, pt. 1.

1921. —— On some Alcyonaria in the Cambridge Museum. Proc. Cambridge Philosophical Soc. Vol. XX. Pt. 3.

1924. —— Introduction to the Study of Corals.

1930. —— Some Alcyonarians from the Eastern Pacific Ocean and On the Classification of the Alcyonaria. Proc. Zool. Soc., Part 1.

1900. —— and HILES, I. L., Stolonifera and Alcyonacea collected by Dr. WILLEY in New Britain. Willey's Zool. Results, Pt. 4.

1895. Holm, O., Beiträge zur Kenntniss der Alcyonidengattung Spongodes. Zool. Jahrb. Abt. Syst. vol. VIII.
1877. Klunzinger., Die Korallthiere des Rothen Meeres, Pt. 1.
1890. Koch, G. von, Die Alcyonaceen des Golfes von Neapel. MT. Zool. Stat. Neapel, vol. IX, Heft. 4.
1875. Kölliker, A., Die Pennatulide Umbellula und zwei neue Typen der Alcyonarien. Festschrift. 25 jähr. Bestehens der Phys.-Med. Ges. Würzburg.
1895. —— Icones Histiologicae. Leipzig.
1926. Kolonko, K., Revision der Alcyonarien. Die Gattung Sinularia. Mitth. Zool. Mus. Berlin, vol. XII.
1896. Kükenthal, W., Alcyonaceen von Ternate. Abh. Senckenb. nat. Ges. Vol. XXIII, Pt. 1.
1902. —— Versuch einer Revision der Alcyonaceen. I. Die Familie der Xeniiden. Zool. Jahrb. Abt. Syst. Vol. XV.
1904. —— Über einige Korallenthiere des Roten Meeres. Jenaische Denkschriften, vol. XI.
1904. —— Versuch einer Revision der Alcyonarien. II. Die Familie der Nephthyiden, 1. Teil, Zool. Jahrb. Abt. Syst. vol. XIX.
1905. —— Versuch einer Revision der Alcyonarien. II. Die Familie der Nephthyiden, 2. Teil. Zool. Jahrb. Abt. Syst. Vol. XXI.
1906. —— Versuch einer Revision der Alcyonarien. II. Die Familie der Nephthyiden, 3. Teil, Zool. Jahrb. Abt. Syst. vol. XXIV.
1906. —— Alcyonacea. Wissenschaftliche Ergebnisse Deutsche Tiefsee Expedition, vol. XIII.
1906. —— Japanische Alcyonaceen. Abhandl. math.-phys. Classe Bayer. Akad. Wiss. Suppl. Bd. I. Abt.
1908. —— Japanische Gorgoniden. I. Die Familien der Primnoiden, Muriceiden, und Acanthogorgiiden. Abh. math.-phys. Classe Bayer. Akad. Wiss. I. Suppl.-Bd., 3. Abh.
1909. —— Japanische Gorgoniden. II. Die Familien der Plexauriden, Chrysogorgiiden und Melitodiden. Abh. math.-phys. Classe Bayer. Akad. Wiss. I. Suppl.-Bd., 5. Abh.
1910. —— Fauna S. W. Australiens. Ergebnisse der Hamburger südwest-australischen Forschungsreise 1905. Vol. III, fasc. 1, Alcyonaria. Jena.
1911. —— Alcyonarien von den Aru- und Kei-inseln. Abh. Senckenb. Nat. Ges. Bd. XXXIII.
1913. —— Alcyonaria des Roten Meeres. Denkschr. math.-nat. Klasse Akad. Wiss. Wien. Bd. LXXXIX.
1913. —— Über die Alcyonarienfauna Californiens. Zool. Jahrb. Bd. XXXV. Abt. Syst. Heft 2.
1919. —— Wissenschaftliche Ergebnisse Deutschen Tiefsee-Expedition, vol. XIII, part 2, Gorgonaria. Jena.
1924. —— Gorgonaria. Das Tierreich. Lieferung 47. Berlin and Leipzig.
1908. Laackmann, H., Zur Kenntnis der Alcyonarien-Gattung Telesto. Zool. Jahrb. Suppl. 11, Heft 1.
1915. Lüttschwager, J., Revision der Familie Alcyoniidae. Archiv. Naturges. Jahrgang 1914, Abt. A, Heft 10.
1886. Marenzeller, E. von, Über die Sarcophytum benannten Alcyoniiden. Zool. Jahrb. Abt. Syst. Vol. I.
1899. May, W., Beiträge zur Systematik und Chorologie der Alcyonaceen. Jenaische Zeitschr. Naturwiss. Vol. XXXIII.
1835. Milne-Edwards, M. H., Mémoire sur un nouveau genre de la famille des Alcyoniens. Ann. Sci. Nat. 2 Sér. T. IV.
1910. Nutting, C. C., Gorgonacea of the Siboga Expedition. The Muriceidae. Monograph XIIIb.
1910. —— Gorgonacea of the Siboga Expedition. The Plexauridae. Monograph XIII b[1].
1910. —— Gorgonacea of the Siboga Expedition. The Isidae. Monograph XIII b[2].
1910. —— Gorgonacea of the Siboga Expedition. The Gorgonellidae. Monograph XIII b[3].
1910. —— Gorgonacea of the Siboga Expedition. The Gorgonidae. Monograph XIII b[4].
1911. —— Gorgonacea of the Siboga Expedition. The Scleraxonia. Monograph XIII b[5].
1889. Pfeffer, G., Zur Fauna von Süd-Georgien. Jahrb. Hamburg Wiss. Anst. Vol. VI.
1903. Pratt, E. M., The Alcyonaria of the Maldives. Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. II, Pt. 1.
1905. —— Ceylon Pearl Oyster Fisheries, Supplementary Report, N⁰ XIX, Roy. Soc. London.
1900. Pütter, A., Alcyonaceen des Breslauer Museums. Zool. Jahrb. Abt. Syst. Vol. XIII.
1907. Reinhart, H., Über den feineren Bau einiger Nephthyiden. Jenaische Zeitschr. Naturwiss. Vol. XLII.
1884. Ridley, S. O., Zoological Collections of the "Alert". London.

1908. ROULE, L., Alcyonaires d'Amboine. Revue Suisse Zool., Vol. XVI, Fasc. 2.

1896. SCHENK, A., Clavulariiden, Xeniiden und Alcyoniiden von Ternate. Abh. Senckenberg. nat. Ges. Bd. XXIII.

1910. SIMPSON, J. J., A Revision of the Gorgonellidae. Proc. Irish Academy, XXVIII, Sect. B.

1922. SHERRIFFS, W. R., Evolution within the genus Dendronephthya (Spongodes), with descriptions of a number of species. Proc. Zool. Soc. London.

1878. STUDER, TH., Übersicht der Anthozoa Alcyonaria. Monatsbericht Akad. Wiss. Berlin.

1888. —— On some new species of the genus Spongodes Less. from the Philippine Islands and the Japanese seas. Ann. Mag. Nat. Hist. Series 6, vol. 1.

1889. —— Supplementary Report on the Alcyonaria collected by H. M. S. "Challenger" during the years 1873—76. Vol. XXXII.

1894. —— Alcyonarien aus der Sammlung des Naturh. Mus. Lübeck. Mt. Geogr. Ges. und Naturhist. Museums Lübeck, 2 ser. Heft 7 und 8.

1901. —— Alcyonaires provenant des Campagnes d'Hirondelle: Résultats des Campagnes scientifiques du Prince de Monaco. Fasc. XX.

1929. TOEPLITZ, CH., Die Gorgonaria Westindiens. Die Familie Gorgonellidae. Zool. Jahrb. Supplement XVI.

1905. THOMSON, J. A., Ceylon Pearl Oyster Fisheries. Supplementary Report, N° XXVIII, Roy. Soc. London.

1927. —— Alcyonaires provenant des Campagnes Scientifiques du Prince Albert de Monaco. Résultats des Campagnes Scientifiques. Fasc. LXXIII.

1905. —— and HENDERSON, W. D., Ceylon Pearl Oyster Fisheries Report, N° XX, Alcyonaria. Roy. Soc. London.

1906. —— —— Alcyonaria of Zanzibar. Proc. Zool. Soc. London.

1906. —— —— Alcyonarians collected by the R. I. M. S. S. "Investigator" in the Indian Ocean. Pt. 1. The Alcyonarians of the Deep Sea. Published by the Trustees of the Indian Museum. Calcutta.

1909. —— and CRANÉ, G., Report on Marine Zoology of Okhamandal in Kattiawar, Alcyonaria, Part I, London.

1909. —— and MACKINNON, D., Alcyonarians collected on the Percy Sladen Trust Expedition. Trans. Linn. Soc. London (Zool.), vol. XIII.

1909 —— and RUSSELL, E. S., Alcyonarians collected on the Percy Sladen Trust Expedition. Trans. Linn. Soc. London (Zool.), vol. XIII.

1909. —— and SIMPSON, J. J., Alcyonarians collected by the R. I. M. S. S. "Investigator" in the Indian Ocean. Pt. II. The Alcyonarians of the Littoral Area. Published by the Trustees of the Indian Museum, Calcutta.

1864. VERRILL, A. E., List of the polyps and corals sent by the Museum of Comp. Zool. Bull. Mus. Comp. Zool. Harvard. Vol. I, N° 3.

1883. —— Report on the Anthozoa, etc. Bull. Mus. Comp. Zool. Harvard. vol. XI, N° 1.

1906. VERSLUYS, J., Primnoiden der Siboga-Expedition. Monograph XIIIa.

1907. —— Die Alcyoniden der Siboga-Expedition. II. *Pseudocladochonus hicksoni* n.g. n.sp. Monograph XIIIc.

1897. WHITELEGGE, TH., The Alcyonaria of Funafuti, Pt. 1. Australian Museum Memoirs, vol. III.

WRIGHT, E. P., and STUDER, TH., Report on the Scientific Results of the voyage of H. M. S. "Challenger", Alcyonaria, 1899, vol. XXXI.

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EXPLANATION OF PLATES

PLATE I.

Fig. 1. *Dendronephthya halterosclera* n. sp. × 2.
Fig. 2. *Dendronephthya intermedia* n. sp. × 2.
Fig. 3. *Dendronephthya amoebisclera* n. sp. Portion of foliaceous collar enlarged.
Fig. 4. *Umbellulifera petasites* n. sp. n. s.
Fig. 5. *Dendronephthya amoebisclera* n. sp. Portion of polyparium enlarged.
Fig. 6. *Dendronephthya intermedia* n. sp. Two polyps enlarged.
Fig. 7. *Nidalia splendens* n. sp. Polyp × 10.
Fig. 8. *Nidalia duriuscula* n. sp. × 8.

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PLATE II.

Fig. 1. *Wrightella superba* Kük. × 4.
Fig. 2. *Nidalia grayi* n. sp. × 2.
Fig. 3. *Wrightella superba* Kük n. s.
Fig. 4. *Pachyclavularia erecta* Roule. Polyp enlarged.
Fig. 5. *Nicella carinata* Nutt. Portion enlarged × 5.
Fig. 6. *Nicella carinata* Nutt. × 2.
Fig. 7. *Pseudocladochonus versluysi* n. sp. Portion enlarged × 10.
Fig. 8. *Pachyclavularia erecta* Roule n. s.
Fig. 9. *Pachyclavularia erecta* Roule. Polyps. × 14.
Fig. 10. *Tubipora musica* Linn. × 3.
Fig. 11. *Sarcophytum trocheliophorum* Marenz. var. *minus* n. n. s.
Fig. 12. *Tubipora musica* Linn. × 3.5.

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PLATE III.

Fig. 1. *Elasmogorgia filigella* n. sp.
Fig. 2. *Dendronephthya lutea* Kük. Portion enlarged.
Fig. 3. *Cactogorgia lampas* Th. & Mack. Polyp × 7.
Fig. 4. *Telesto rubra* Hickson.
Fig. 5. *Cactogorgia lampas* Th. & Mack. × 1.5.
Fig. 6. *Dendronephthya reticulata* n. sp. Portion enlarged × 20.
Fig. 7. *Sympodium* (see appendix to Sympodium) × 4.

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PLATE IV.

Fig. 1. *Siphonogorgia cylindrata* Chalmers × 2.
Fig. 2. *Siphonogorgia gracilis* (Harrison).
Fig. 3. *Siphonogorgia variabilis* (Hickson).
Fig. 4. *Siphonogorgia gracilis* (Harrison).
Fig. 5. *Siphonogorgia obspiculata* Chalmers.
Fig. 6. *Siphonogorgia mirabilis* Klunzinger.
Fig. 7. *Siphonogorgia mirabilis* Klunzinger.
Fig. 8. *Siphonogorgia ramosa* Chalmers.
Fig. 9. *Siphonogorgia ramosa* Chalmers.
Fig. 10. *Siphonogorgia variabilis* (Hickson).
Fig. 11. *Siphonogorgia*?
Fig. 12. *Siphonogorgia variabilis* (Hickson).
Fig. 13. *Siphonogorgia*?

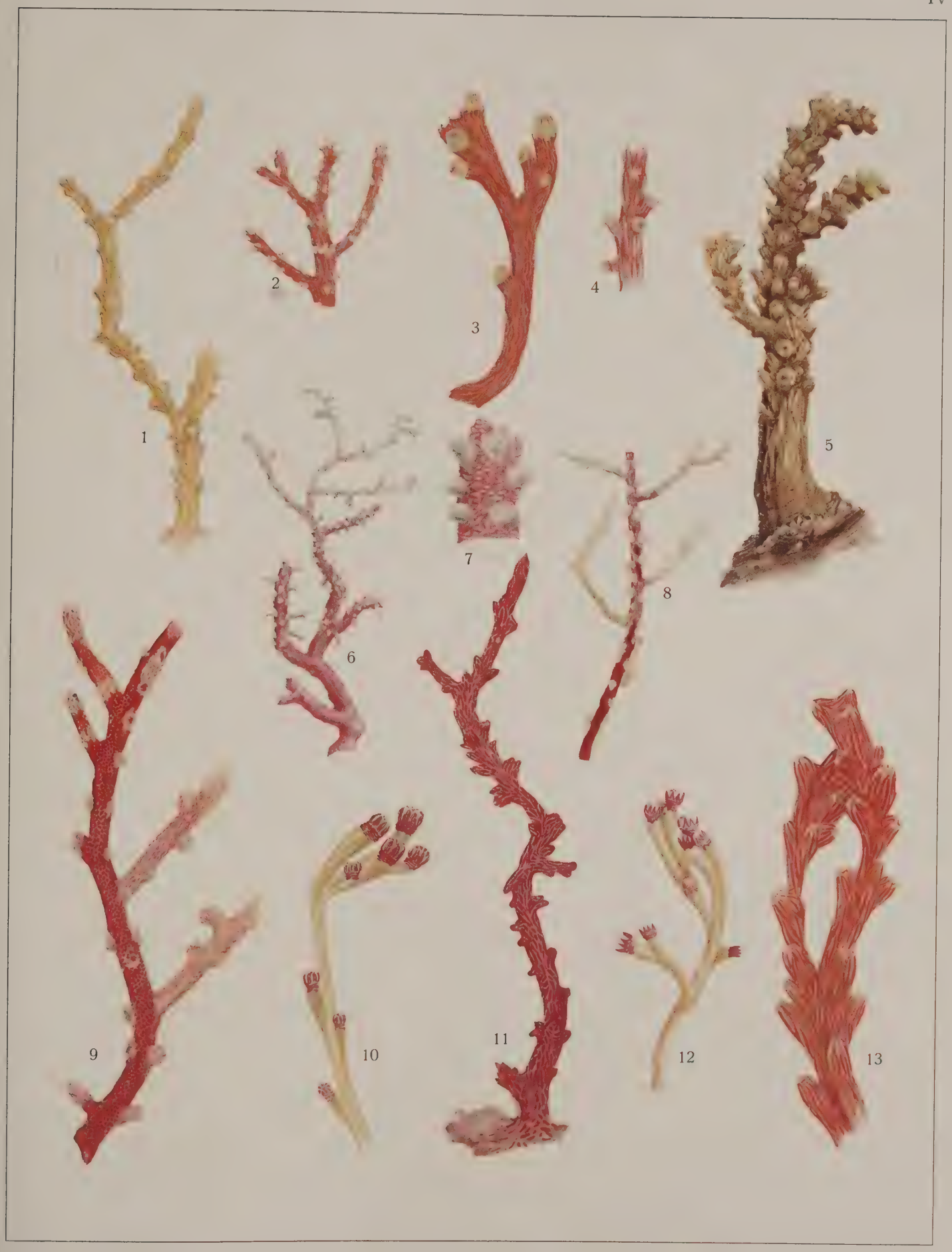
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PLATE V.

Fig. 1. *Telesto rubra* Hickson. × 2.
Fig. 2. *Acis squamata* Nutt. × 2.
Fig. 3. *Isis hippuris* Linn. × 3.
Fig. 4. *Echinogorgia pseudosassapo* Kölliker. × 2.
Fig. 5. *Nidalia dofleini* Kük.
Fig. 6. *Pachyclavularia erecta* Roule. × 2.
Fig. 7. *Pachyclavularia erecta* Roule. Front.
Fig. 8. *Semperina köllikeri* (Studer). × 7.
Fig. 9. *Pachyclavularia erecta* Roule. Back.

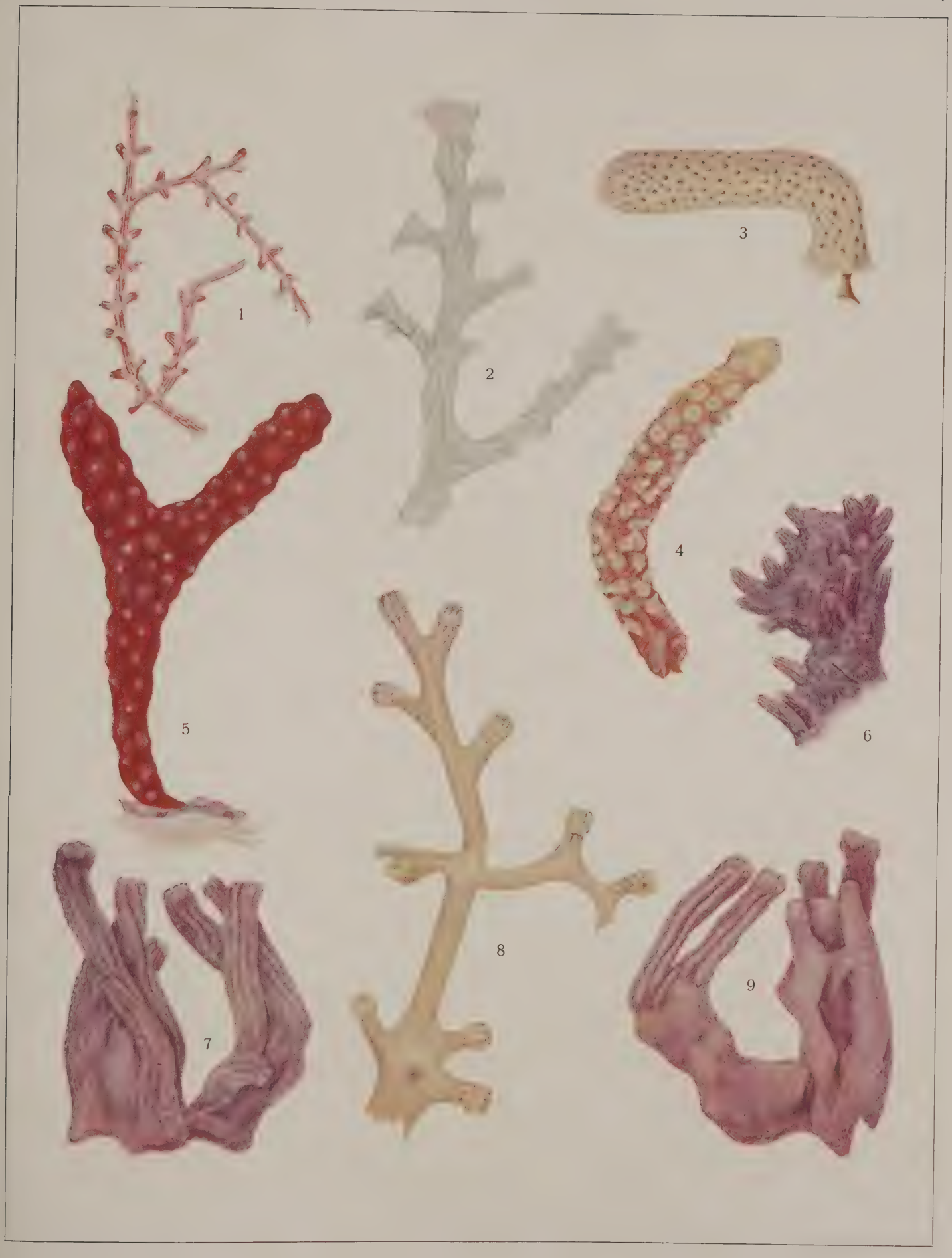
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PLATE VI.

Fig. 1. *Telesto rubra* Hickson.
Fig. 2. *Telesto rubra* Hickson. Portion enlarged.
Fig. 3. *Telesto rubra* Hickson. × 3.5.
Fig. 4. *Telesto rubra* Hickson. × 1.5.
Fig. 5. *Studeriotes debilis* n. sp.
Fig. 6. *Keroeides koreni* W. & S. var. Portion enlarged.
Fig. 7. *Keroeides koreni* W. & S. Portion enlarged × 3.5.
Fig. 8. *Keroeides koreni* W. & S. × 1.5.
Fig. 9. *Nidalia splendens* n. sp.
Fig. 10. *Cactogorgia lampas* Th. & Mack.
Fig. 11. *Studeriotes spinosa* n. sp. Young.

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PLATE VII.

Fig. 1. *Elasmogorgia filigella* n. sp.
Fig. 2. *Stereonephthya bellissima* n. sp. n. s.
Fig. 3. *Stereonephthya bellissima* n. sp. Portion enlarged × 5.
Fig. 4. *Stereonephthya bellissima* n. sp. Portion enlarged × 14.
Fig. 5. *Stereonephthya bellissima* n. sp. × 4.
Fig. 6. *Telesto rubra* Hickson.
Fig. 7. *Stereonephthya macrospiculata* Th. & Mack. × 3.
Fig. 8. *Muricellisis cervicornis* n. sp.
Fig. 9. *Stereonephthya imbricans* n. sp. × 1.5.
Fig. 10. *Clavularia delicatula* n. sp. × 2.
Fig. 11. *Stereonephthya imbricans* n. sp. × 2.

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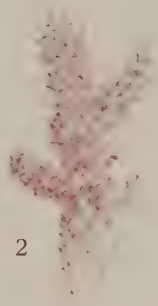
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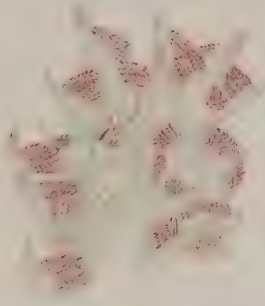
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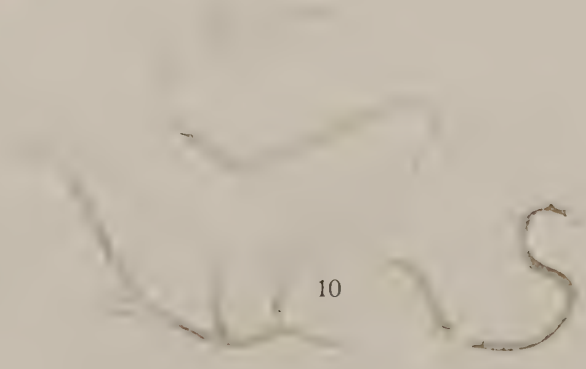
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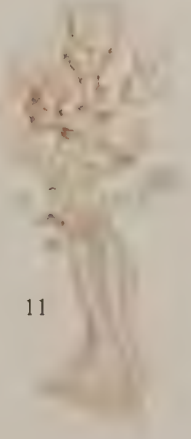
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PLATE VIII.

Fig. 1. *Sinularia gardineri* (Pratt). × 1.5.
Fig. 2. *Alcyonium simplex* n. sp.
Fig. 3. *Alcyonium molle* n. sp. n. s.
Fig. 4. *Lobularia globuliferoides* n. sp. × 2.
Fig. 5. *Sinularia whiteleggei* Lüttsch. × 1.5.
Fig. 6. *Sarcophytum glaucum* (Q. & G.) n. s.
Fig. 7. *Nidalia macrospina* Kük. n. s.

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PLATE IX.

Fig. 1. *Sarcophytum ehrenbergi* Marenz. n. s.
Fig. 2. *Lemnalia thyrsoides* (Ehrb.) (not typical, contracted).
Fig. 3. *Protodendron repens* n. g.
Fig. 4. *Umbellulifera graeffei* (Kük.) n. s.
Fig. 5. *Alcyonium dendroides* n. sp.
Fig. 6. *Lemnalia thyrsoides* (Ehrb.).

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PLATE X.

Fig. 1. *Nephthya capnelliformis* n. sp. n. s.
Fig. 2. *Capnella fungiformis* Kük.
Fig. 3. *Umbellulifera striata* (Th. & H.) × 2.
Fig. 4. *Nephthya cervispiculosa* n. sp. × 1.5.
Fig. 5. *Capnella fungiformis* Kük.
Fig. 6. *Capnella imbricata* (Q. & G.) × 2.

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PLATE XI.

Fig. 1. *Clavularia expansa* n. sp. Portion enlarged.
Fig. 2. *Bebryce thomsoni* Nutt. n. s.
Fig. 3. *Clavularia expansa* n. sp. n. s.
Fig. 4. *Telesto arborea* W. & S.
Fig. 5. *Sinularia leptoclados* (Ehrb.).
Fig. 6. *Telesto arborea* W. & S.
Fig. 7. *Sarcophytum convolutum* n. sp. n. s.

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PLATE XII.

Fig. 1. *Alcyonium rotundum* n. sp. n. s.
Fig. 2. *Sinularia querciformis* (Pratt) × 1.5.
Fig. 3. *Lemnalia peristyla* Bourne.
Fig. 4. *Hicksonia köllikeri* Dean × 2.
Fig. 5. *Hicksonia köllikeri* Dean × 2.
Fig. 6. *Hicksonia köllikeri* Dean × 2.
Fig. 7. *Hicksonia viridis* (Q. & G.) × 1.5.
Fig. 8. *Hicksonia viridis* (Q. & G.) × 1.5.

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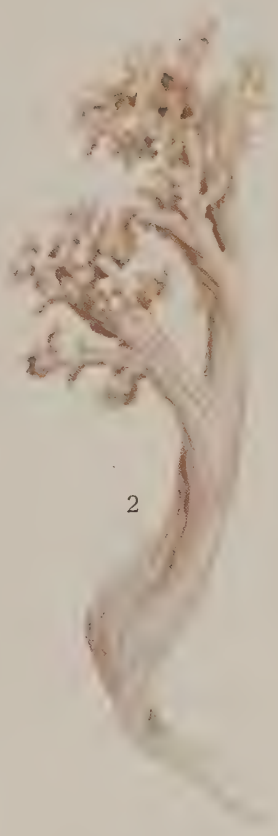

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PLATE XIII.

Fig. 1. *Nephthya gracillima* n. sp. × 1.5.
Fig. 2. *Studeriotes debilis* n. sp.
Fig. 3. *Studeriotes spinosa* n. sp. Two polyps enlarged.
Fig. 4. *Studeriotes spinosa* n. sp. × 3.
Fig. 5. *Paralcyonium elegans* M.-E. × 3.
Fig. 6. *Studeriotes longiramosa* Kük. n. s..
Fig. 7. *Studeriotes spinosa* n. sp.
Fig. 8. *Studeriotes longiramosa* Kük. n. s. Branches strongly contracted.

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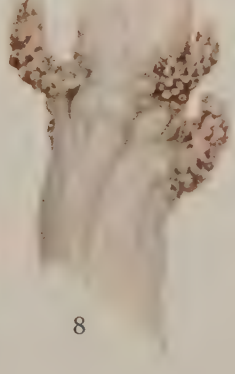

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PLATE XIII.

PLATE XIV.

Fig. 1. *Clavularia ornata* n. sp. × 1.5.
Fig. 2. *Anthelia ternatana* (Schenk). Polyp × 6.
Fig. 3. *Semperina macrocalyx* (Nutt.) × 1.5.
Fig. 4. *Anthelia simplex* n. sp. × 2.5.
Fig. 5. *Clavularia ornata* n. sp. Polyp × 10.
Fig. 6. *Lemnalia peristyla* Bourne.
Fig. 7. *Lemnalia laevis* n. sp. × 6.
Fig. 8. *Lemnalia laevis* n. sp. n. s.
Fig. 9. *Lemnalia cervicornis* (May) × 2.

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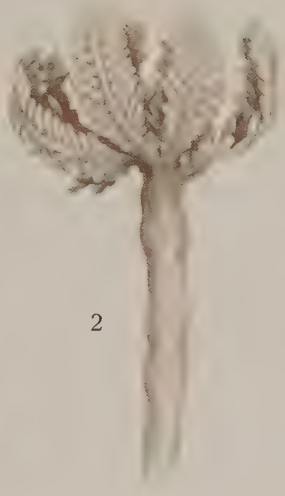
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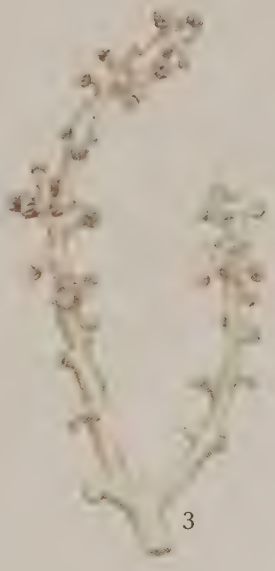
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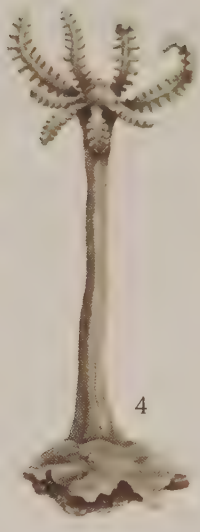
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PLATE XV.

Fig. 1. *Xenia novae-britanniae* Ash. Tentacle back view.
Fig. 2. *Xenia novae-britanniae* Ash. Colony back view.
Fig. 3. *Xenia novae-britanniae* Ash. Colony front view.
Fig. 4. *Xenia novae-britanniae* Ash. Tentacle front view.
Fig. 5. *Pseudocladochonus mosaica* n. sp. × 2.
Fig. 6. *Cactogorgia simpsoni* n. sp. Polyp enlarged.
Fig. 7. *Alcyonium dendroides* n. sp.
Fig. 8. *Cactogorgia simpsoni* n. sp. × 2.
Fig. 9. *Pseudocladochonus mosaica* n. sp. Portion enlarged × 10.
Fig. 10. *Lemnalia squamifera* n. sp. n. s.
Fig. 11. *Scleronephthya flexilis* Th. and Sim. var. *compacta* n. × 1.5. Polyps contracted.
Fig. 12. *Discogorgia bebrycoides* (Nutt.).

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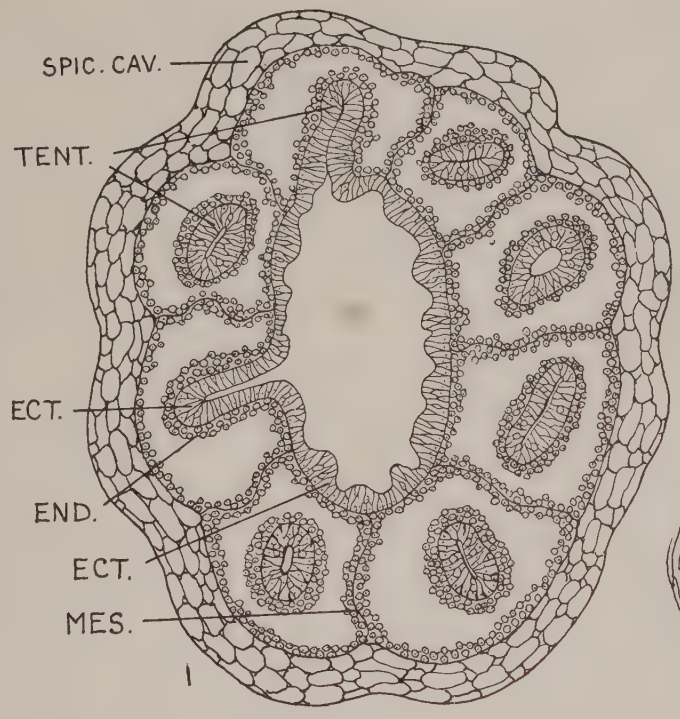
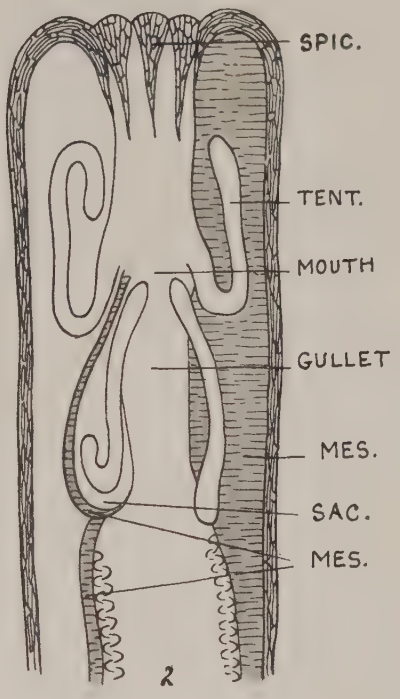
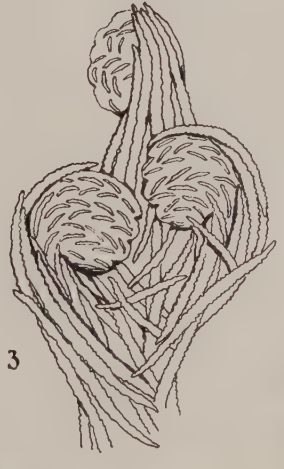
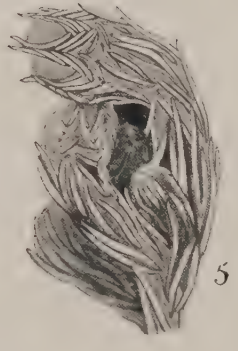
PLATE XVI.

Fig. 1. *Pachyclavularia erecta* Roule.
Fig. 2. *Pachyclavularia erecta* Roule.
Fig. 3. *Nephthya gracillima* n. sp. 3 Polyps enlarged × 30.
Fig. 4. *Studeriotes debilis* n. sp. Polyp enlarged.
Fig. 5. *Stereonephthya imbricans* n. sp. Group of polyps × 10.
Fig. 6. *Sarcophytum acutangulum* (Marenz.). Young colony × 4.5.
Fig. 7. *Sarcophytum glaucum* (Q. & G.). Young colony n. s.
Fig. 8. *Sinularia tentaculata* n. sp.
Fig. 9. *Acis squamata* Nutt. × 4.









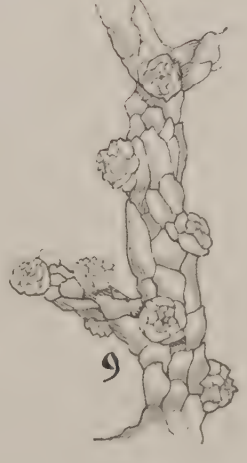


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PLATE XVII.

Dendronephthya.

Fig. 1. *Diagrammatic illustration* of a typical Glomerate.
Fig. 2. *Diagrammatic illustration* of a typical Divaricate.
Fig. 3. *Diagrammatic illustration* of a typical Umbellate.

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PLATE XVIII.

Figs. 1—5. *Dendronephthya stolonifera* (May).

W. WEBSTER del.

PLATE XIX.

Fig. 1. *Dendronephthya.* — Grade I.
Fig. 2. *Dendronephthya.* — Grade II.
Fig. 3. *Dendronephthya.* — Grade III.
Fig. 4. *Dendronephthya.* — Grade IV.
Fig. 5. *Dendronephthya.* — Grade V.
Fig. 6. *Dendronephthya.* — Grade VI.
Fig. 7. *Dendronephthya amoebisclera* n. sp.
Fig. 8. *Dendronephthya gigantea* (Verrill).
Fig. 9. *Dendronephthya gigantea* (Verrill).
Fig. 10. *Dendronephthya punicea* (Stud.).
Fig. 11. *Dendronephthya suensoni* (Holm).
Fig. 12. *Dendronephthya mollis* (Holm).
Fig. 13. *Dendronephthya ehrenbergi* Kük.
Fig. 14. *Dendronephthya cervicornis* (Wr. & Stud.).

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PLATE XX.

Fig. 1. *Dendronephthya mirabilis* Hend.
Fig. 2. *Dendronephthya flammea* Sherriffs.
Fig. 3. *Dendronephthya klunzingeri* (Stud.).
Fig. 4. *Dendronephthya microspiculata* (Pütter).
Fig. 5. *Dendronephthya orientalis* Hend.
Fig. 6. *Dendronephthya collaris* (Wr. & Stud.).
Fig. 7. *Dendronephthya longicaulis* Kük.
Fig. 8. *Dendronephthya disciformis* Kük.
Fig. 9. *Dendronephthya habereri* Kük.
Fig. 10. *Dendronephthya pumilio* (Stud.).
Fig. 11. *Dendronephthya coronata* (Wr. & Stud.).
Fig. 12. *Dendronephthya brevirama* (Burchardt).
Fig. 13. *Dendronephthya annectens* Sherriffs.
Fig. 14. *Dendronephthya annectens* Sherriffs. Ensheathing type of supporting bundle: seen from below.
Fig. 15. *Dendronephthya simplex* Sherriffs.
Fig. 16. *Dendronephthya hyalina* (Kük.).

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PLATE XXI.

Fig. 1. *Siliceous sponge.*
Fig. 2. *Clavularia ornata* n. sp.
Fig. 3. *Sarcophytum spongiosum* n. sp. (Capitulum).
Fig. 4. *Sarcophytum spongiosum* n. sp. (Stalk.).
Fig. 5. *Lobularia globuliferoides* n. sp.
Fig. 6. *Sinularia leptoclados* (Ehrb.).
Fig. 7. *Dendronephthya amoebisclera* n. sp.
Fig. 8. *Compound Ascidian.*
Fig. 9. *Sinularia leptoclados* (Ehrb.).
Fig. 10. *Anthogorgia annectens* n. sp.
Fig. 11. *Umbellulifera petasites* n. sp.
Fig. 12. *Muricellisis cervicornis* n. sp.

W. WEBSTER del.

PLATE XXII.

Fig. 1. *Echinogorgia aurantiaca* (Val.).
Fig. 2. *Sinularia querciformis* (Pratt).
Fig. 3. *Sinularia polydactyla* (Ehrb.).
Fig. 4. *Sinularia gardineri* (Pratt).
Fig. 5. *Sarcophytum trocheliophorum* Marenz.
Fig. 6. *Sarcophytum tenuispiculatum* n. sp.
Fig. 7. *Scleronephthya flexilis* Thoms. & Simps. var. *compacta* n.
Fig. 8. *Nephthya cervispiculosa* n. sp.
Fig. 9. *Hicksonia köllikeri* Dean.

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PLATE XXIII.

Fig. 1. *Sarcophytum convolutum* n. sp.
Fig. 2. *Lobularia ceylonicum* (Pratt).
Fig. 3. *Alcyonium simplex* n. sp.
Fig. 4. *Clavularia delicatula.* n. sp.
Fig. 5. *Sinularia tentaculata* n. sp.
Fig. 6. *Nidalia rubra* (Brundin).
Fig. 7. *Nephthya capnelliformis* n. sp.
Fig. 8. *Sinularia gardineri* (Pratt).
Fig. 9. *Lithophytum stuhlmanni* (May).
Fig. 10. *Muricella argentea* (Nutting).

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PLATE XXIV.

Fig. 1. *Echinogorgia complexa* Nutting.
Fig. 2. *Capnella imbricata* (Q. & G.).
Fig. 3. *Cespitularia simplex* n. sp.
Fig. 4. *Alcyonium molle* n. sp.
Fig. 5. *Capnella imbricata* (Q. & G.).
Fig. 6. *Semperina macrocalyx* (Nutting).
Fig. 7. *Sympodium fulvum* (Forsk.).
Fig. 8. *Alcyonium rotundum* n. sp.
Fig. 9. *Spongioderma chuni* Kük.
Fig. 10. *Clavularia expansa* n. sp.

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PLATE XXV.

Fig. 1. *Siphonogorgia obspiculata* n. sp.
Fig. 2. *Telesto rubra* Hickson.
Fig. 3. *Siphonogorgia ramosa* n. sp.
Fig. 4. *Echinogorgia pseudosassapo* Kölliker.
Fig. 5. *Nidalia dofleini* Kük.
Fig. 6. *Nidalia duriuscula* n. sp.
Fig. 7. *Wrightella superba* Kük.
Fig. 8. *Nidalia splendens* n. sp.
Fig. 9*a*. *Pseudocladochonus versluysi* n. sp.
Fig. 9*b*. *Pseudocladochonus versluysi* n. sp.
Fig. 10. *Elasmogorgia filigella* n. sp.
Fig. 11. *Siphonogorgia flavorubra* n. sp.

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PLATE XXVI.

Fig. 1. *Dendronephthya disciformis* Kük. (Sterile Stalk).
Fig. 1*a*. *Dendronephthya disciformis* Kük. (Upper Coenenchyma).
Fig. 2. *Dendronephthya armifer* n. sp.
Fig. 3. *Dendronephthya halterosclera* n. sp.
Fig. 4. *Dendronephthya habereri* Kük.
Fig. 5. *Dendronephthya florida* (Esper).
Fig. 6. *Dendronephthya dofleini* Kük.

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PLATE XXVII.

Fig. 1. *Nephthya junipera* n. sp. Polyp enlarged.
Fig. 2. *Nephthya tenuis* (Kük.). Spicule of canal wall.
Fig. 3. *Cactogorgia simpsoni* n. sp.
Fig. 4. *Sarcophytnm acutangulum* (Marenz.). Three stages of growth, n. s.
Fig. 5. *Nephthya junipera* n. sp.
Fig. 6. *Stereonephthya ilex* n. sp. Polyp enlarged.
Fig. 7. *Pseudocladochonus mosaica* n. sp.
Fig. 8. *Lemnalia squamifera* n. sp.

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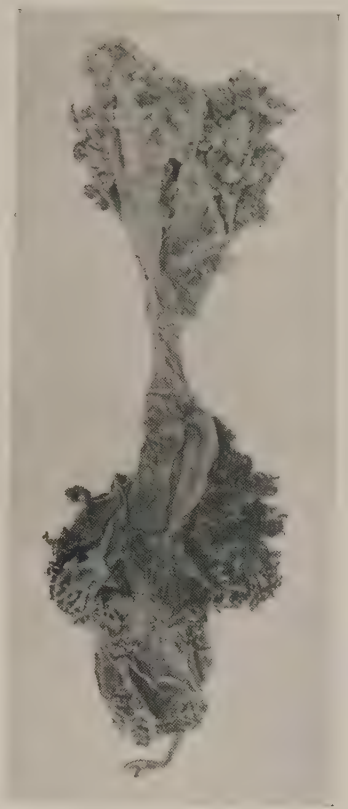
PLATE XXVIII.

Fig. 1. *Dendronephthya amoebisclera* n. sp.
Fig. 2. *Dendronephthya annectens* Sherriffs.
Fig. 3. *Dendronephthya gigantea* Verrill.



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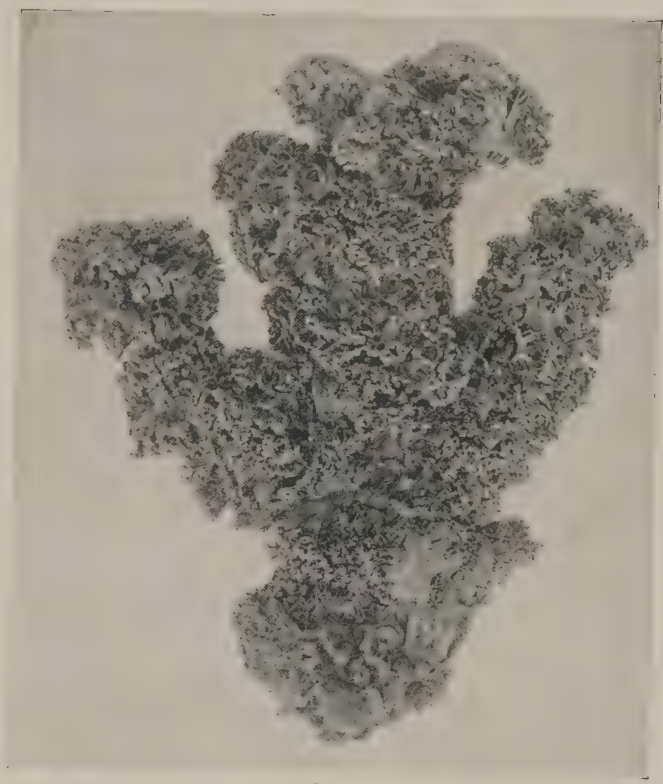

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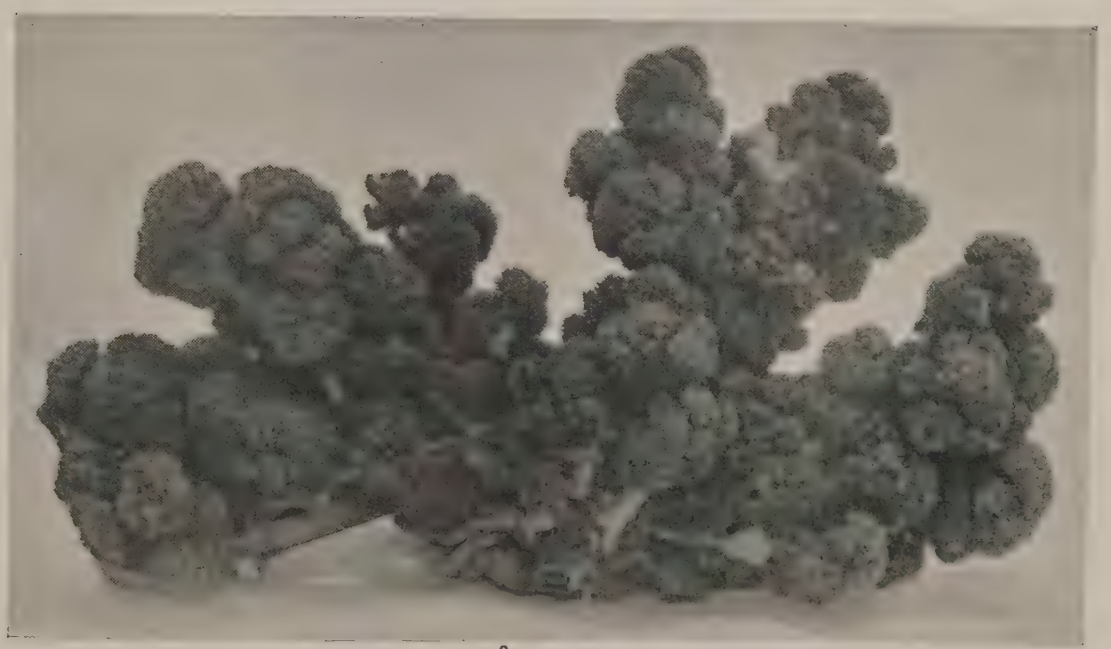

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SIBOGA-EXPEDITIE

RÉSULTATS DES EXPLORATIONS ZOOLOGIQUES, BOTANIQUES, OCÉANOGRAPHIQUES ET GÉOLOGIQUES

ENTREPRISES AUX INDES NÉERLANDAISES ORIENTALES EN 1899—1900

À BORD DU SIBOGA SOUS LE COMMANDEMENT DE

G. F. TYDEMAN

IER LIEUTENANT DE MARINE

PUBLIÉS PAR

MAX WEBER

CHEF DE L'EXPÉDITION

Déjà paru:

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